Canadian Pacific R. R. Contractors.

Correspondence of the Port Arthur Herald.

Thinking a brief sketch of the Canadian Pacific Railway, from Red Rock to Big Pic River—now under construction—might be interesting and, perhaps, useful to some of your readers, I hand you a few notes taken during a recent trip over that portion of the line. The respective location of contracts and contractors are frequently confused, which makes it inconvenient, especially for those making the journey. With a view to make this more plain I have made a list, giving location of each, consecutively.

Red Rock so called from the massive bluffs of red rock in this vicinity, lies 63 miles north-east of Port Arthur on the north-east shore of Nepigon Bay. It is at present called the terminus of the Port Arthur & Nepigon Division, although iron is laid some four miles farther east. All supplies are now landed at this point and distributed over the line to the east by teams. The C. P. R. Co. have here a large warehouse, store and telegraph office.

NEPIGON.—Four miles to the north-east we reach the flourishing village of Nepigon. It is beautifully located on the banks of Lake Helena and Nepigon River. Although but a few months since the first hut was erected, to-day it boasts of five stores, three saloons and five hotels and boarding-houses. The road crosses Nepigon River at this point. Mr. R. G. Reid has the contract of building the bridge, which is to be an iron structure some 700 feet long and over 80 feet high. Two of the stone piers are now completed. Work has been suspended until spring. A short way down the river the Hudson's Bay Company have a large trading post and the Red Rock post-office. On the east bank of N pigon River the chainage starts at zero, running eastward. Mileage is generally calculated from this point to Pic River. On the first thirty-four miles east grading is about all completed. Messrs. E. F. Lemay & Son are doing the bridge work and working a large force of men. On the ninth mile we cross Jackfish River, and five miles further strike Mazurkamo Bay, A number of men, under Mr. Joe Grant, are laying track both ways from this point.

CYPRESS BAY. Frank & Co. are about finished grading the 23rd mile. They have also several thousand ties to make and deliver and are working some 40 men. A little to the west of here Mr. James Ireton has opened a No. 1 boarding and lodg ng house for the accommodation of travelers. Grand River is crossed about the 29th mile; a short way to the east Gravel Bay is reached. The line scales the shore of this bay for some five miles, running in an L shape. Work this far has been comparatively light and principally earth. On the 35th mile we strike rock. The grading for some six miles west of here has been done by Mr. Allan McDonald. He has now some 50 men at work on this and expects to finish in March. This is contract "1," he having two more east of here.

Mr. Philip McRae, contractor, is working the 36th mile; material all rock; tunnel about the centre of work 900 feet long. Two boarding camps, store and dwelling house. Mr. A. R. McLennan has a contract of part of west end and Mr. Angus McLean a cutting on east end, employing in all about 150 men.

Mr. Allan R. McDonald has the 37th, 38th and 39th miles; work pretty well under way; material all rock and very heavy; one cutting having 32,000 yards; two tunnels on the work, one 280 feet and the other 120 feet long; five camps running, large store, office and dwelling house; about 300 men at work. We cross the point at which Gravel and Pays Plat Bays join, about the east end of the 37th mile. The line now follows the shore of Pays Plat for some miles.

Mr. John Graham & Co. have the next four miles; west of work is rock, the balance being light filling with a few sand-cuttings. About two miles of the work now completed. Here several camps are running, a store and a dwelling house. About 120 men at work. Mr. E. P. Langrill has a contract of part of the work and employs about 40 men. On an island across from west end of this work the Lake Superior Powder Co. have a factory "No. 1."

Mr. Allan R. McDonald has the 44th and 45th miles. Material all rock, with very heavy cuttings; working about 150 men; three boarding camps and store.

Mr. Matthew Brown has the next six miles which commences at the west of the 46th mile; material principally rock work, which is pretty well opened up. He has seven set of camps running, a large store and dwelling house, working about 300 men.

MCKAY'S HARBOR.—Here, on the east end of the 48th mile, we find one of the most secure harbors on Lake Superior. During navigation this was a busy port, but the land slide which occurred last fall, did much to hurt it. The C. P. R. Co. have several large warehouses, a wholesale store, telegraph office, engineers' office and two large dwelling houses.

Mr. J. S. Winston & Company have eight miles, the principal part of which is solid rock. Work is opened out in good shape; they have ten set of No. 1 camps running, three large stores at different points on the work, a telegraph office and general business office at headquarters and two dwelling houses. They have now 600 men employed—the most of any one on the line.

Mr. James Isbister, working about seven miles—material pretty much all rock. Has six camps running, a fine headquarters store and office; employs about 300 men.

Mr. D. H. McKenzie has a contract of about seven miles, material principally sand; which is all sublet and a good portion of it completed. On the east end McMillan & McDonald have a sand-cutting 3,800 feet long. There are six or seven set of camps on the work. Headquarters at Terrace Bay, about midway on the work and three-quarters of a mile to right of line, working about 250 men.

Mr. R. G. Reid comes next, with between six and seven miles of rock work and very heavy. About five miles of west end sub-let to different parties—McLeary & Anderson, one mile, working some 50 men. Sprague & Gordon, one mile, about 35 men. Judge & Co. have nearly two miles and are working two steam drills and hoist; have two boarding camps, store and office, employing about 70 men. Rodgers & Fay are working about 40 men on their three-quarters of a mile contract. There are a number of small jobbers on the work. The two miles on east end, Mr. Reid works himself, which is exceedingly heavy work, one cut having in the neighborhood of 35,000 yards of solid rock, and a tunnel near the end of the work about 450 feet long. He has four camps, a large store, office and dwelling house on Jackfish Bay. working about 200 men.

JACKFISH BAY.—This is one of the chief points on the road. A great many supplies were landed here during the fall season. The C. P. R. Company have extensive docks built, warehouses and several minor buildings. The village also boasts of a post-office, telegraph office, jewelry shop, two stores and doctor's office. G. H. Middleton, chief engineer, has his headquarters here. The road follows the shore of this bay for six or seven miles.

Messrs. McRae & Massey have about three miles of work, material a good part rock, some gravel cuttings. Have four camps and store; a force of 160 men, with work pretty well advanced.

Mr. Dave Ogilvie, working part of 87th mile, has some heavy rock cuttings. He has one set of camps and store; about 30 men employed.

Mr. M. Dwyer & Co. are at work on 88, 89 and 90th miles, material mostly gravel and sand with some rock. One set of camps, store and dwelling house; working about 30 men. This is contract "1."

Mr. Angus Sinclair's work on 91st and 92nd miles consists principally of rock, with some sand and gravel. He has five camps, store and dwelling house. About 250 men on the work; road crosses Steel River on 91st mile.

Dwyer & Co. are working 93rd and 94th miles; material, rock, clay and muskeg; east end pretty light; one set camps and store; have about 85 men.

Messrs. Johnson & Schohl are at work on the 95th mile, which is chiefly rock, with between 60 and 70 men. Camps and store on their work.

Nothing doing on the next three miles. The work is let to some gentleman in St. Paul, but it being light I expect nothing will be done on it until spring; it appears to be all muskeg.

D. B. McDonald & Co. have the 100th and 101st miles, which is rock, sand and muskeg; east end of the work is very rough: three camps and store. Have about 100 men.

McDonald, Cameron & Co. have the next two miles; which is nearly all rock and very rough; three camps, store and dwelling house (kept by Mr. Parker). Have at present some 60 men; work pretty well advanced.

H. G. Reid & Co., working the 104th and 105th miles, material nearly all rock with one large sand cutting. Would pronounce this a No. 1 contract, being pretty much all side cuttings. Have three boarding camps and store, and working 160 men. Road crosses Little Pic river about centre of the work.

John Doheney on the 106th mile principally sand with some rock on east end; is operating about 40 men at present. Has a set of camps and store.

E. M. Egan is working 107th mile; material rock and sand. One set of camps, store and dwelling house; he has about 40 men at work. A son of Mr. Egan had his leg broken a short time ago by a fall of frozen sand.

John Ryan & Co. are working on the 108th mile which is rock and sand; work very heavy; have two steam drills and hoists; two camps, store and dwelling house; employ at present about 100 men.

F. Ericsson has the adjoining two miles, principally rock and very heavy, but pretty well advanced. He has five boarding camps and dwelling house, with about the best general store on the line. Working about 320 men.

McKay & Co. are working the 111th and part of the 112th miles. All rock and mostly side-cuttings; two camps, store and dwelling house; work about fifty men.

FORT CALDWELL.—This port is about east end of 111th mile and some few hundred yards to the right line. Contractors in this vicinity have their supplies landed here during navigation. The Lake Superior Powder Company have their No. 2 factory here, and Dyer & Co. a large store.

John Robinson has the eastern half of 112th mile, which is all rock; has one camp and store, and is working thirty men.

Kenneth McLeod comes next with three miles; material nearly all rock, with two tunnels 410 and 125 fe t long. Running two bo rding camps, store and headquarters on Red Succor Cove. The smaller steamers call here: the line crosses Mink River about east end of 113th mile. Working at present about eighty men. This is one of the hardest contracts on this division, and will test the man's metal who has to walk over it.

McDonald, Cameron & Co. are working the 116th mile, which is principally rock; they have two boarding camps and store; about 50 men employed. This is the same company that are working 102nd and 103rd miles.

M. H. Kelpyn has the next mile and has at present about 25 men at work; he has one camp and store. Material, rock and earth.

PORT MUNROE.—There is quite a harbor here and contrac or's docks built and supplies are landed here by steamers during navigation.

Doan & Wright are working the 118th mile, which is principally rock. They have about 100 men at work and have two boarding camps and store.

Nothing doing on the next two miles work appears to be light.

H. F. Donking, who has the 120th mile, which is all rock, has about 50 men at work. Has one camp, store and dwelling house.

On the east end of 120th mile R. G. Reid is opening a quarry and taking out stone for the bridge across Big Pic River. He has 35 men at work.

Densmore & Richardson have the next four miles, three and a half of which is sand filling, a good portion of which is now completed. Have two set of camps, headquarters, store and some station camps; working about 60 men.

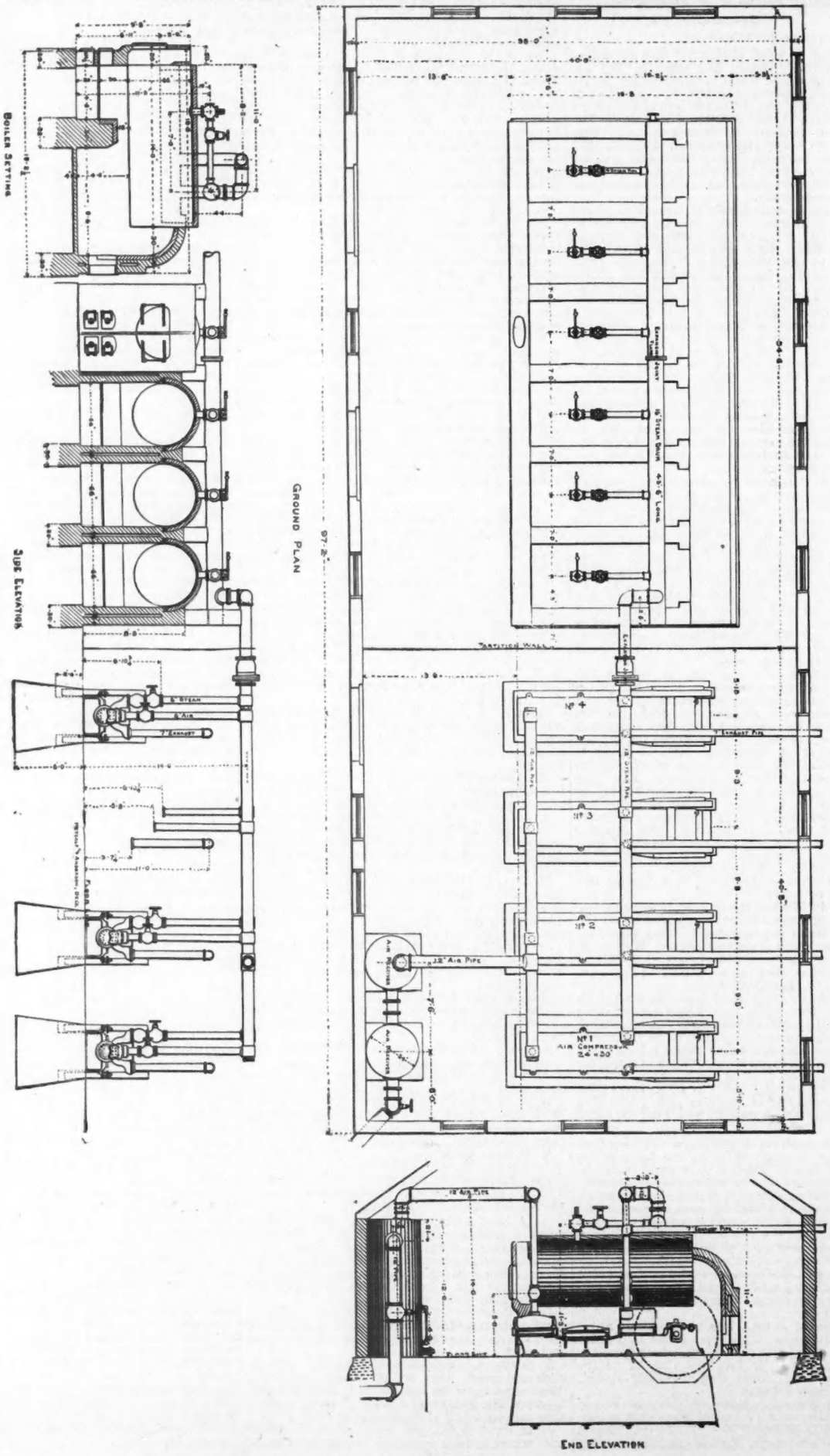
PENINSULA HARBOR.—This is the last port of any consequence at which the road touches Lake Superior, and may be utilized in future for trans-shipping, The C. P. R. Co. have here large docks built, several warehouses, offices and dwelling houses. Pinkerton & Co., timber contractors, have their headquarters here. This is also headquarters of R. McLennan, Esq., chief engineer.

McCall Brothers, working 125th and part of 126th miles, material principally gravel and sand, having two sets of camps and working about 20 men.

J. J. Elliott, working balance of 125th mile with the next two miles, material rock and sand, two boarding camps and store; has about 40 men at work.

Doheny & Hazelwood, working 129th mile, material all rock and work pretty heavy; one boarding camp and store, with headquarters at Herring Bay; working at present about 35 men. Here we see Lake Superior for the last time. The line now strikes inland.

Wardrope & Co., working the next two miles; material on west end, rock; east end, light filling about one mile of which is now completed. Have one set of camps and store; working about 40 men. On the east end of 131st mile we reach Big Pic River. Line crosses this fine stream six miles above the point where it empties into Lake Superior. The Hudson's Bay Co. have here a trading-post and the Pic River post-office, Mr. Spence in charge. On the east bank of the river Mr. Fitzpatrick has his headquarters and is working the first fifteen miles eastward. In a few words, I may say, the country is exceedingly rough; the works—all through—probably the heaviest grading on the continent. The contractors, with very few exceptions, all practical railroad men with good capital and good men. In fact, a better class cannot be found on any public works. The employés are of mixed denominations; honest, good fellows, as a rule, the majority of whom are saving money. Of the engineering department, too much could not be said. To see so feasible a route through so rough a country is, indeed astonishing, and shows energy and great abilities in those who located it.



AIR COMPRESSING PLANT, WASHINGTON AQUEDUCT TUNNEL.

THE WASHINGTON AQUEDUCT TUNNEL, AND ITS COMPRESSED AIR PLANT.

The water situation in Washington is a somewhat peculiar one. The source of supply is unlimited and the existing mains could bring to the city twice the quantity at present consumed; but the loss of head due to such a forcing process would almost entirely deprive the residents of the higher levels of a water supply; and of late years the growth of the city has been very largely upon this high-lying ground. It is to remedy this defect that the present works are being constructed.

The general plan of Washington given this week sufficiently explains the location of the proposed tunnel and the new reservoir; the latter will be supplied from the present distributing reservoir, beyond Georgetown, and a 48-in. main will lead the water from the new reservoir into the city distribution. The ground lying between the two basins is elevated and undulating, to a degree that makes a tunnel necessary. This tunnel will be about 21,000 ft. long, 11 ft. wide and 7½ ft. high. It will be driven through rock for the entire distance, and from the geological formation little trouble is expected from water.

As the purpose of the present article is to describe the contractors plant, we will leave the tunnel and its completed arrangements for the conveyance of water a subject for future consideration.

Four working shafts are located upon the tunnel line, marked A, B, C and D, upon the general plan. Compressed air has been adopted by the contractors, Messrs. Beckwith & Quackenbush as a motive power, not only for the drills to be used, but also for all hoisting, pumping and ventilating purposes. The contract requires four drills in a heading, or twenty-eight drills in all.

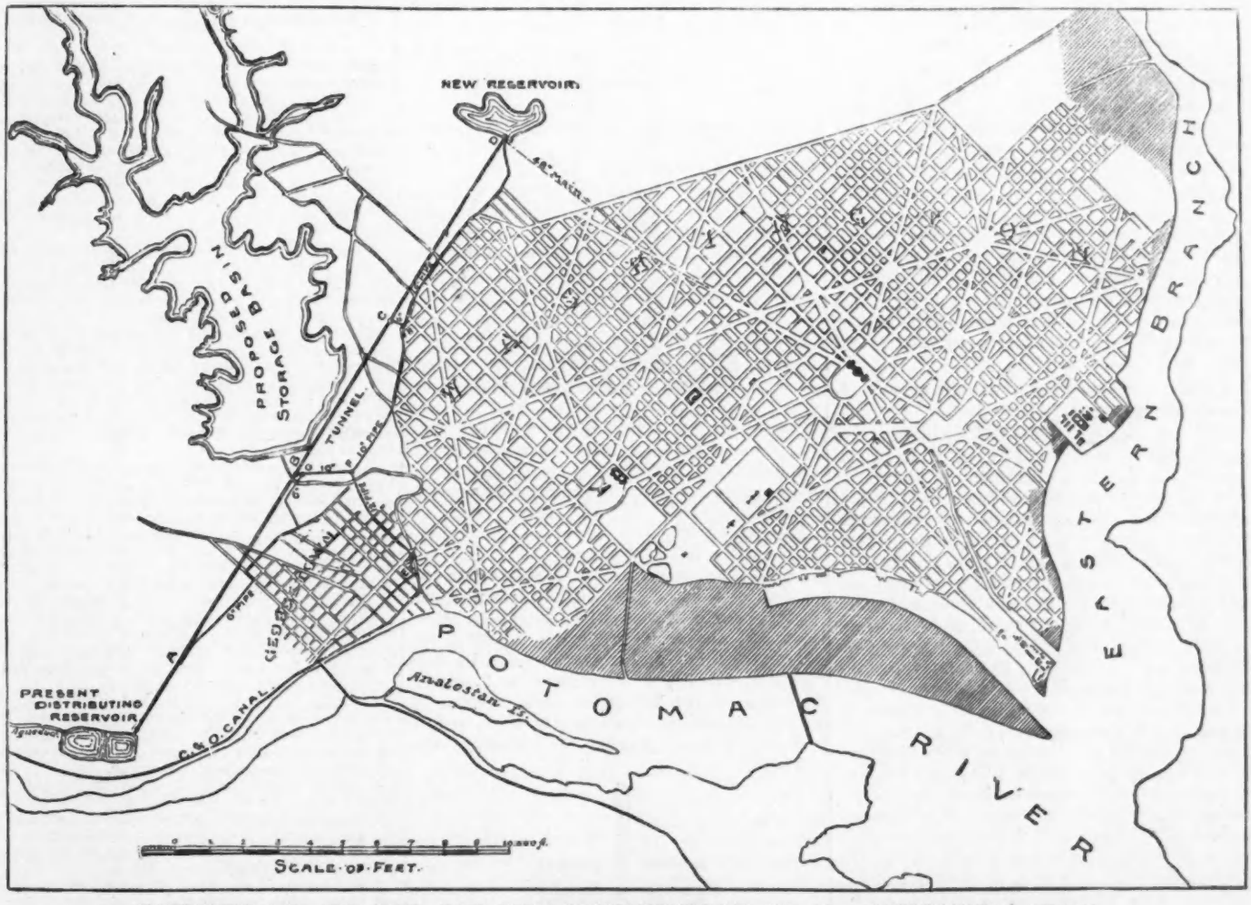
Under these circumstances it can readily be seen that the power required to run this combined plant was necessarily great, and formed a serious item in the preliminary work. The well-known machinery of the Ingersoll Rock Drill Co. having been selected by the contractors, as best adopted to the work in hand, the first point to be settled was whether each shaft should be fitted out with a separate plant, or a central station provided to supply the whole four miles of work. This subject was carefully considered by Mr. Pierce the Vice-President of the Ingersoll Co. and the contractors and their consulting engineer; the hauling of some 500 tons of coal per month over the steep roads of the region covered, and the amount of skilled labor required by a divided plant was found to outweigh in cost the necessary pipe line, of a central plant, and the latter was adopted as the most economical.

The supply of fuel being a guiding consideration, the central station was located at E on the general plan, near the mouth of Rock Creek, and directly upon the Chesapeake and Ohio Canal, where coal could be delivered at a minimum cost. A substantial building was here erected to cover the compressing plant about to be described. The power is furnished by six return tubular boilers, made by the Ingersoll Co., each boiler 66 in. in diameter and 14 ft. long. These boilers being arranged in one battery, as shown on the plan, have running over the rear ends, a steam-drum 16-in. in diameter and 44 feet long, supported upon the brick dividing walls. A 4-in. steam pipe, starting from a nozzle in the front of each boiler, each provided with a throttle valve, etc., leads the steam from the boilers into the common steam-drum. This arrangement makes it possible to cut off any one or more of the boilers at will.

Four Ingersoll "Straight-Line" compressors (described in ENGINEERING NEWS of Jan. 12) compressed the air. These machines are of the latest construction as regards design, economy of steam used and convenience of operation; they have 24-in. cylinders and 30-in. stroke. The steam ends are fitted with adjustable cut-off valves. To the air-cylinders are attached pneumatic, automatic regulators, which govern the speed of the engines, maintain air of uniform pressure in the pipes, and thus do awy with the wasteful and expensive practice of "blowing off." Space forbids our describing in detail this exceedingly ingenious device, but we must further remark that it will throw the engine "off centre" if carelessly left in that position, and through it the men in the headings, miles away, practically regulate the speed of the compressing engine and the consumption of fuel in proportion to the amount of air consumed.

During the compressing process, the air is kept cool by a spray of water injected into the air-cylinder by a small pump, and is discharged in this condition into the air-receiver.
two of these receivers as shown. The from the compressors, by a 12-in. pipe which enters at the top of receiver No. 1, and descends inside to within a short distance of the bottom of the tank; as there is about two feet of water in each tank, the air is discharged beneath the surface, and must rise through this water, before it can pass over, through another 12-in. pipe to receiver No. 2; it there again discharges under water as before, and finally, from the top of the second receiver, passes into the general supply main.

This rather paradoxical method of passing compressed air through water, to dry it, experience teaches, is the most practical way of depriving it of the moisture that would otherwise give trouble by freezing in the exhaust ports of the machines using it. It is the system in use with the best European compressors, but the Ingersoll Co. is the first, we believe, to successfully apply it in this country. The builders of the "Straight-Line" compressors claim that a working air pressure of



GENERAL PLAN OF WASHINGTON, D. C., TUNNEL, ETC.

80 lbs. per square inch can be maintained by a steam pressure of 60 lbs., cutting off at ⅞ stroke, or with an average steam pressure of 46 lbs.

To convey this compressed air to the working faces of the tunnel, a pipe line, 5 miles long over ground, is required; and by the time the tunnel is completed, 10 miles of pipe will be in use; this will be the greatest distance compressed air has ever been carried in this country. The air leaves the second receiver at the Central Station by a 12 in. cast-iron pipe, and passes, by a line indicated upon the general plan, to the point F; it there terminates in a boiler-iron equalizing tank 4 ft. long and 20 in. in diameter. From this tank two 10 in. pipes branch out, one to supply shafts B and A, the other towards shafts C and D. Near shaft B a 6 in. pipe leads the air to A; and in like manner another 6 in. pipe passes from the neighborhood of C to D shaft.

All the overground pipe is cast-iron, bell-jointed and leaded; the pipe follows as near as possible the street lines, and is buried beyond the risk of interference or damage. The estimated loss from friction is only 5 per cent. owing to the generous section of the pipe used.

In the shafts and the tunnel, 6 in. and 4 in. wrought-iron pipe will be employed.

The plant to be operated by this compressed air is as follows: Four Lidgerwood hoisting engines, double-geared, reversible link-motion, with clutch and safety-brakes; these engines will handle balanced cages. For the present there will be three Knowles pumps, each with cylinders 10x6x12 in., and two Knowles pumps with 8x6x12 in. cylinders. The drill plant will consist of 28 Ingersoll "Eclipse" Rock Drills, 3½ in. cylinders, of the improved tunnel pattern, with variable stroke.

The daily contract progress to be made is 49 lineal feet of completed tunnel.

For the general plan of Washington presented, we are indebted to Capt. R. L. Hoxie, of the Engineering Department of that city, who has also furnished other data used in this article. The plan shows some other features of engineering interest, besides the tunnel line; the cross-sectioned portions show the limits of the improvement of the Potomac Flats, and the regulation of the Eastern Branch, now in part in course of construction. Near the tunnel-line is indicated the proposed Rock Run Storage Basin, referred to by us lately in our notice of the last annual report of the Engineering Department of Washington. This storage basin is a wise provision both for the immediate present and the future needs of Washington, and is the result of a long and exhaustive study of the subject by Capt. Hoxie. As remarked by him in his report, its construction would do away with the ever-present danger of depending upon one source of supply; it would provide a daily supply of 26 million gallons, gathered from a rocky and uncontaminated water-shed, so near the distribution that long conduits and the resulting loss of head would be avoided. And more important still, as soon as the future would require it, a supply of 500 million gallons per diem, if wanted, can be obtained from the Great Falls of the Potomac, by connecting the upper end of this basin with the point named by a combined canal and tunnel line. It is a project worthy of the central seat of government, and the department that has its engineering improvement in charge.

ERIE, PA., Feb. 13.—A company was organized to-day for lighting Erie by electricity. The capital stock is $100,000 in shares of $100 each, which is all subscribed except 15 shares. W. L. Cleveland is President; J. F. Downing, Vice-President; Charles C. Shirk, Secretary and Treasurer. Contracts have been signed with the Brush Company, of Cleveland, and the works will be in operation in 30 days.

Foundations of a Bridge over the Rokugo on the Yokohama R. R. Japan.

The interesting feature of this structure is the method of founding the piers. Piers Nos. 24, 25 and 26 are each made up of two brick wells, about 11 ft. 10 in. in diameter outside, resting upon a bed of volcanic cinder met with at a depth of 77¾ ft. below the level of the rail; these wells are filled with beton.

Piers Nos. 27, 28 and 29 are made up each of two cylinders of cast iron 7 ft. 10½ in.. exterior diameter, resting upon a bed of hard gravel, about 86½ft. below the level of the rail. These columns are filled with beton, are tied together

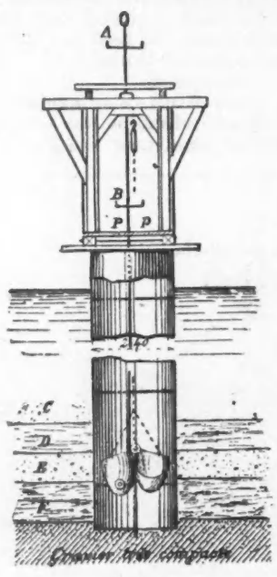


FIG. 1.

A. Wrench which remains immovable when the excavation is going on.
B. Wrench removed at each hoist of material.
P P. Platform for workmen when turning wrench *B.*
C. Light clay mixed with shells.
D. Yellow clay.
E. Volcanic cinder.
F. Compact blue clay.

by braces, and carry a horizontal beam on top supporting the bridge proper. The south abutment is made of four brick wells like those described above. These brick cylinders are about 2 ft. thick, and are solidly tied by iron bands and bolts, spaced about 10 ft. apart. The shoe at the bottom is made of wrought iron and wood and is about 2 ft. high, with a diameter a little greater than that of the cylinder.

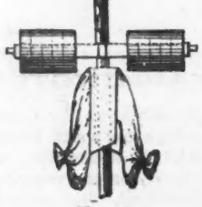


FIG. 2.

A SIDE ELEVAVION OF THE DREDGE.

The least depth of foundation was 55.⅞ ft., the greatest depth below the surface of the soil was 58½ ft. In sinking the shoe with its ring of masonry, the soil was removed from the interior, at first by a hand dredge, then by a sand pump until the mud was reached, this last being nearly dry was removed by an excavator shown at Fig. 2. A water bearing stratum was then reached which was passed as rapidly as possible by hastening the masonry.

The excavator used in the drier portion is a very simple and useful apparatus employed in Japan for digging under water. It consists of two sacks, fixed each to an iron frame with a cutting edge. These frames are attached to a vertical bar, around which the sacks can be rotated and as a consequence dig a circular trench. This apparatus has been improved by bolting the frames upon a square socket which adapts itself to the head of a vertical bar, which remains in the well while the sacks are being raised for emptying. As pressure is necessary to sink the edge of the frames into the soil, this pressure is obtained by weights upon the horizontal bar, as shown in Fig. 2. Four to six sacks can be filled in an hour.

When the digging was liable to interruption from too much water, the iron cylinders mentioned, were used, sunk by a different process. A staging upon piles was first put in place at the site of the pier, carrying a track and a traveller by the aid of which the iron segments forming the cylinder were handled. These segments weighed 4 tons each and were 6 ft. high; wooden guides were used to insure their vertical position. Two and one-half feet was the least distance sunk in 10 hours.

How Asphaltum Pavements are Made.

After a foundation of cement, mortar and concrete has been made, there is laid the wearing surface or pavement proper, the basis of which or paving cement must be pure Trinidad asphaltum unmixed with any of the products of coal tar. The wearing surface should be composed of: (1) Refined Trinidad asphaltum; (2) heavy petroleum oil; (3) fine sand, containing not more than one per centum of hydrosilicate of alumina; (4) fine powder of carbonate of lime.

The Trinidad asphaltum (so called), whether crude or refined, as found in this market, contains from 20 to 35 per cent. of impurities, and is especially refined and brought to a uniform standard of purity and gravity.

The heavy petroleum oil, which may be the residuum by distillation of the petroleum oils as found in the market, generally contains water, light oils, coke and a gummy substance soluable in water. This petroleum oil is freed from all impurities and brought to a specific gravity of from 18° to 22°. Beaume, and a fire test of 121° C.

By melting and mixing these two hydrocarbons, petroleum oil and asphaltum, the matrix of the pavement, called asphaltic cement, is manufactured, which cement has a fire test of 121° C., and at a temperature of 15.5° C. has a specific gravity of 1.19. They are mixed in the following proportions by weight: Pure asphalt, 100 parts; heavy petroleum oil, 15 to 20 parts.

The asphaltic cement being made in the manner above described, the pavement mixture is formed of the following materials and in the proportions stated: Asphalt cement, from 12 to 15; sand, from 73 to 80; pulverized carbonate of lime, from 5 to 15.

In order to make the pavement homogeneous, proportion of asphaltic cement must be varied according to the quality and character of the sand. The sand and asphaltic cement are heated separately to about 149° C. The pulverized carbonate of lime while cold is mixed with the hot sand in the required proportions, and is then mixed with the asphaltic cement, at the required temperature and in the proper proportion, in a suitable apparatus which will effect a perfect mixture.

The pavement mixture, prepared in the manner thus indicated, should be laid on the foundation in two coats. The first coat, called cushion coat, should contain from two to four per cent. more asphaltic cement than given above; it should be laid to such depth as will give a thickness of half an inch after being consolidated by the roll. The second coat, called surface coat, prepared as above specified, should be laid on the cushion coat; it should be brought to the ground at a temperature of about 121° C., and if the temperature of the air is less than 10°, iron carts with heating apparatus should be used in order to maintain the proper temperature of the mixture. It must then be carefully spread, by means of hot iron rakes, in such a manner as to give a uniform and regular grade, and to such depth that after having received its ultimate compression it shall have a thickness of two inches. The surface must be compressed by hand rollers, after which a small amount of hydraulic cement should be swept over it, and it must be thoroughly compressed by a steam roller weighing not less than 250 pounds to the inch-run, the rolling being continued for not less than five hours for every 1,000 yards of surface.

The powdered carbonate of lime must be of such degree of fineness that from five to fifteen per cent., by weight, of the entire mixture for the pavement shall be an impalpable powder

of limestone, and the whole of it shall pass a No. 26 screen. The sand must be of such size that none of it will pass No. 80 screen, and the whole of it shall pass a No. 10 screen. In order to make the gutters, which are consolidated but little by traffic, entirely impervious to water, a width of twelve inches next the curb should be coated with hot pure asphalt and smoothed with hot smoothing irons, in order to saturate the pavement to a certain depth with an excess of asphalt.

IRON NOTES.

The Shawnee Furnace at Columbia, is preparing to blow in.

The American Sheet Iron Co. at Phillipsburg N. J., has stared up its mill after a stoppage of ten weeks.

The Thomas Iron Co., at Hokendauqua, has blown in its fourth furnace, and the fifth will soon be put in blast.

The Hartman Steel Works in Beaver Falls, are running single turn in all the departments. The new bar mill is nearly finished.

The Cleveland Rolling Mill Company, in Cleveland, O., is now running all the departments of its mills full time. The company has lately taken the orders for 25,000 steel rails.

The Penn Iron Works in Lancaster, Pa., has started up in all the departments, except the puddling mill, which is stopped on account of a strike against a reduction of wages.

The Old Virginia Nail and Iron Works, in Lynchburg, Va., have started up making bar iron and nails. They are also making all the light iron rails for a narrow gauge road, at Indian Rock, near Lynchburg.

The Oliver and Roberts' Wire Company, of Pittsburg, is building a rolling mill in addition to their wire works for the manufacture of wire rods. It will be finished in two months and will be the only rod mill in the city.

The Delaware Bridge Company, of New York, built the great iron viaduct over Stony Brook Glen on the new Lackawanna and Pittsburg road, which is 700 feet long and 237 feet high from the bed of the stream.

The St. Louis Malleable Iron Company is working eight large annealed ovens, but still cannot keep pace with its orders without sending part of its work to other malleable works. The company will soon begin building two more.

THE INDUSTRIAL SITUATION.

The industrial situation this week, is, in brief, as follows: Some 30,000 employes in textile manufacturing establishments throughout New England are temporarily idle; four or five thousand by reason of strikes, and the remaining number by reason of the reduction to half time, or the closing down of mills until demand shall justify resumption. This has been reflected in an improving demand for the productions of these establishments, and in firmer prices for nearly all the lines of goods made. Outside of textile interests there is an improving activity, as for instance, in foundries, mills, and the hundred and one smaller manufacturing industries. In the railroad shops throughout the country a great deal of activity is reported. Repairing is being actively prosecuted. Railway managers are practising rigid economy in repairing engines and cars, and making the material they have go as far as individual prudence and economy could do. This application of economy to corporation management is one of the encouraging features of the past few years. Earlier in the history of our large corporations, less care was given to such matters; but a spirit of emulation has been stimulated and developed, and its workings have had a very beneficial effect upon the net earnings, and even the dividends of roads. The manufacturers of railway supplies of all kinds, and brokers handling such material, report a fair degree of inquiry from nearly all railroads. Whatever may be the condition of railway construction, this much can be safely said: that in the matter of completing equipments of roads, a great deal of liberality is being displayed. More cars and locomotives are wanted and are being ordered, one of the latest orders being from the Pennsylvania Company, and for 160 locomotives. Vanderbilt's and Garrett's, and three or four other lines have given out orders for locomotives and cars within a short time. Spreckles, of San Francisco, is in the East for the purpose of placing contracts for two additional vessels. The contract will probably be secured by the Cramps, who have built several vessels for him. A ship building company has been formed at Bath, Maine, called the New England Ship Building Company, with a capital of $500,000. It has $300,000 of work already in hand. One or two other companies are projected, but it will depend on Congressional action whether they will take shape or not.

Two new influences are at work in the iron trade. One is, the checking of the further extension of the blast furnace industry in the north, and the extending it in the south, where coal, ore and labor are cheaper and nearer to furnaces. The other is the substitution of steel for iron for a greater multitude of purposes. This invasion was inaugurated by the substitution of steel rails for iron rails, 15 years ago, and since then, inventive talent has been at work to still further adapt steel to the purposes heretofore served by iron. Machinery for some few mills has recently been ordered to make steel, and several manufacturers are considering the advisability of following in their course. A good deal of steel for construction purposes is being made, at the same price for which iron has heretofore been sold, and this is attracting the attention of manufacturers and builders, which will eventually lead to very extensive manufacture of steel for these purposes. It is evidently only a question of time, when the use of steel will very materially restrict the number of purposes to which iron is now applied.

Within the past six months, several new nail factories have been erected in Pennsylvania, Ohio, West Virginia and Indiana, and in the far west some progress has also been made in nail making. The capacity is now very largely in excess of the probable market requirements, and hence, manufacturers are endeavoring to originate some policy by which profits can be realized, and their machines still be kept employed. The workmen have suggested a ninety days suspension in the summer, and are organizing to effect such an arrangement. The manufacturers are opposed to this sort of control, and met on Wednesday of this week to decide what course to pursue. The only possible course is to continue to restrict production, and if trade interests will permit, it would be wise to accept the suggestion made by the workmen and suspend operation during the hottest part of the summer.

A delegation of Pennsylvania and Ohio manufacturers appear before the Congressional Committee this week to oppose the Morrison Tariff Bill. This bill seems to have aroused the opposition of all classes—manufacturers, merchants, free traders and protectionists. The weakness of the proposed measure is easily recognized by manufacturers not only of iron and steel, but of textiles, and other products. This measure is one of those which a person uninformed as to the requirements of industrial legislation, and who is not disposed to struggle with details, and moreover, who is anxious to please an exacting constituency, would find it easy to devise. It is similar in some respects to the compromise bill of Henry Clay, which went into effect in 1833, and provided for a gradual reduction of duties until 1837. The industries of the United States are gradually rising out of the necessity for protection, but the contest between the protectionists and their free trade school is one which will not be easily settled; in fact, it is not desirable that it should be, because the possibility of successful antagonism acts as a stimulant to inventive talent and enterprise, and makes manufacturers strive to perfect their appliances and cheapen cost of production in order to keep themselves and their interests safe from the possibilities of the most radical free trade legislation.

SELECTED MISCELLANY.

JAPAN has 4733 miles of telegraph and 22 miles of railway.

NOT only in Paris but throughout Europe the cry of the unemployed is rising high. Holland is much troubled with it. In Amsterdam and Rotterdam there are large numbers of unemployed.

AN attempt is about to be made on a large scale, to drain and replant the Roman Campagna. A certain amount of drainage work has been made compulsory on the land-owners, and no fewer than 80 irrigation companies under Government control have been set to work to reclaim the waste lands. Minor experiments have meanwhile been fairly successful. Long deserted spots about S. Paolo fouri le Mura have been made habitable by plantations of eucalyptus.

PROTECTION OF WATER PIPES AGAINST RUPTURE.—Messrs. Buxton & Ross attach a special valve to the extremity of a water-pipe, which can be opened automatically by electricity. They connect with it a thermometer, which is so arranged as to close an electric circuit when the temperature approaches the freezing point. By the influence of the current a wedge is released which allows the valve to fall into place and open the emptying faucet.—*Chronique Industrielle.*

THE entire income of the University of Cambridge is put down at £231,265, 8s., 2d. Oxford has at least £100,000 more; but the two together make up but little more than half what Lord Dudley has received in one good colliery year, or what the Dukes of Devonshire and Northumberland together annually receive on an average, while Mr. Vanderbilt's income would pretty nearly cover the receipts of Oxford, Cambridge, Dublin, Durham, Yale, Harvard and Princeton combined.

THE manufacture of rope from asbestos is likely to become an industry of considerable importance in England, the strength of the article being estimated at about one-fourth that of ordinary hemp rope of the same diameter. Rope of this material of one and a half inches in diameter is stated to have a breaking strength of one ton, and twenty feet of it are calculated to represent a weight of thirteen and one-fourth pounds. Some of the purposes, as enumerated, to which this kind of rope is especially adapted, are theatres, fire brigades, and means of escape from dwellings and public buildings, its advantage being that it will not break and drop its burden if the flame bears upon it. It is made like ordinary rope, and is spun from Italian asbestos thread.

THE bill to amend the patent laws introduced by Senator Platt, and which passed the Senate recently, provides that no person shall be debarred from receiving a patent for an invention or discovery, because of its having been first patented in a foreign country, unless it shall have been introduced into public use in the United States for more than two years prior to the application for such a patent in this country, and that a patent granted in the United States for an invention previously patented in a foreign country shall expire 7 years from the date of the issue of such foreign patent, or if there be more than one such patent 17 years from the date of the earliest.

AN exploring party has recently returned to Sidney from a journey through central Australia with camels. Several long stages without water were encountered a few days after the party left Cawarrie Station, on the Warburton River, and a distance of from 200 to 300 miles had been traversed across the highest sand ridges in Australia before water could again be obtained. The camels behaved nobly,, although carrying immense loads, weighing between 700 and 800 pounds each. The party recovered sufficiently in two days to make the second stage of about 150 miles without water. Many more long stages of between 100 and 200 miles without water were traveled. In many instances the sand ridges were from 300 to 400 feet high and very steep, and had to be crossed at right angles.

THE general break-down of joint stock enterprises created and managed by Chinese, probably results from more than mere inexperience. It brings out clearly a serious defect in the Chinese character which will prevent their ever accomplishing anything really great in the field of commerce or finance—the incapacity to work honestly for others. It is the same defect which prevents their civil, military, or naval administrations from attaining to any position of importance. Peculation rules from the Emperor to the coolie, and in all their undertakings individualism so strongly asserts itself that the effectual co-ordination of forces required to bring any enterprise to a successful issue is not attainable. It will, no doubt, be a great disappointment to the enlightened among them to discover that this taint on the character of the people is indelible, and that, much as they wish to get rid of the presence of foreigners, it is nevertheless to foreigners they must apply to organize the resources of their country, whether by means of railways, steamboats, mines or any other form of combined effort whose success depends on the certainty that every man will do his duty.

Engineering News

AND

AMERICAN CONTRACT JOURNAL.

Tribune Building, - - - New York City.

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CLUBBING ARRANGEMENTS 1884.

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THE price of Clemann's Railroad Engineer's Practice, 3d edition, just out, is $1.50.

WE will pay ten cents each for copies of ENGINEERING NEWS of December 29, 1883, and of January 12 and 19, 1884. We will take all that we can get and will be obliged if parties who dont care to preserve their papers, will send us these particular numbers.

If subscribers who failed to receive an Index of last year's volume will notify us at once, we will supply them by return mail. After awhile it will be too late.

The Kansas City street-paving controversy referred to by us last week, has been decided by the City Council awarding the entire contract to Mr. McGonegal, whose bid was the lowest for the total work.

The vote in the City Councils was preceeded by a lively discussion for and against the action of the awarding committee; and while the opinion existed that the committee had a legal right to divide the contracts as they did, the final decision gave general satisfaction, especially to the rate-payers effected by the difference in prices.

The article upon "Raising and Moving Buildings in America," published by us last week, was improperly accredited to the "Society of Engineers, England." It was originally contributed to the Institution of Civil Engineers, by Samuel George Artingstall, Assoc. M. Inst. C. E., and City Engineer of Chicago.

Jersey City's Proposition to Furnish New York with Water.

Under date of Feb. 6, the Mayor and Sub-Committee of the Councils of Jersey City make a formal proposition to supply New York with water, as referred to by us a short time ago.

The substance of the proposition is as follows: The city of Jersey City is prepared to enter into negotiations with the city of New York for the supplying of the latter city with 30,000,000 gallons daily from the Passaic River; Jersey City proposing to build a settling basin at Belleville of 150,000,000 gals. capacity at an elevation of 159 ft. above high water; to lay mains conducting this water to the west bank of the Hudson River at the foot of 14th, St., Jersey City, with an available head at this point of 137 ft. The cost of the water to New York will range from 50½ cents per 1,000 cubic feet on a contract for four years, to 32 or 33 cents per 1,000 cubic feet on a contract for ten years. The City of New York is to lay the submerged main under the Hudson at an estimated cost of $700,000. It would require from one and a half to two years to construct the necessary works.

The committee believe the Passaic water to be pure and abundant in quality for the purpose proposed. Under present circumstances they cannot guarantee more than 30,000,000 gallons daily, nor for a longer period than ten years.

THE MEXICAN RECIPROCITY TREATY.

Mr. W. W. Nevin, a gentleman intimately acquainted with the situation in Mexico, has lately published several letters upon the Reciprocity Treaty, now under discussion at Washington.

In referring to the popular objection to its adoption, that this treaty is in the interests of the railroads, Mr. Nevin admits that it undoubtedly is, but that this country will be as much benefitted as the transportation companies by a more liberal basis of exchange of goods between the two countries.

To the charge that such a treaty will foster peonage in Mexico and bring this form of qualified slavery into competition with the free labor of the North, the answer is made that peonage is not a legal slavery, and the quickest way of breaking it up is by the introduction of railroads into the most remote corners of rural Mexico.

Under the existing system of commercial exchange between Mexico and the United States, we place a duty of 45 per cent. upon nearly all goods coming from Mexico, and the government of that country retaliates by taxed us from 80 to more than 100 per cent. for such of their products as we most need. The practical working of this almost prohibitory tariff, is to stop all trains at the border line; and in effect to measure the commercial intercourse by the comparatively few articles that now stand upon the "free list" As evidence of this, Mr. Nevin states that ¼ in value of all the imports of merchandise from Mexico, is found in the brief list of articles admitted free of duty.

In the blind antagonism shown against the treaty now under consideration, the actual work done in Mexico since 1881 is certainly not appreciated. Within less than three years, $66,000,000 of American capital, or capital raised by American effort, has been expended upon Mexican soil in the construction of railroads; 2400 miles are already built and the total swells at the rate of one mile per day; the frontier line is already crossed at four different points, and the Rio Grande as a dividing line is obliterated.

In response to this combined effort of the Mexican government, with its concessions and franchises, and the American, with his capital, skill and organization, we already have evidence of a healthy, legitimate growth in the commercial relations of the two countries. The exports and imports have already increased in value from $20,809,103 in 1871, to $34,645,000 in 1883.

With this showing, in spite of the depressing conditions mentioned, the possibilities of expansion under a generous treaty are unlimited. The trade between the two countries would be stimulated to a degree that could make itself felt from Texas to Maine; the loss of present duties would be insignificant and unworthy of consideration in the light of the general gain.

The St. Cloud, Minn., Water Works.

The erection of water works, mainly for fire purposes, was agitated last year. After examining plans presented by Mr. Beach of Minneapolis, the special committee of councils on water supply, adopted on May 30, 1883, those made by Messrs. Pike & Sturtevant, Civil Engineers. The system proposed by these last named gentlemen was the direct pumpage or Holly System, taking the water from the Mississippi River.

On September 12, 1883, a contract for their construction was let to V. D. Simar & Co., for $21,175, the works to be completed by Dec. 15. Operations were at once commenced, and have just been brought to a successful close.

The pump-house is a brick structure, 30x46 feet, with metal roof, stone foundations and iron stack. In this building are three pumping engines of the Gaskill patent, made by the Holly Co. Their combined capacity is 1,400,000 gallons in 24 hours. The pump-well is 8x14 ft., and 5 ft. deep, supplied by a 16-in. intake pipe from the river.

Of the mains laid, 2,730 ft. are 8-in. pipe, and 2,696 ft. 6-in pipe. Fourteen Matthews hydrants are in place. The total cost will not exceed $24,500. To meet this outlay $20,000 of bonds have been sold, realizing $19,625.

The work has been done under the supervision of Pike & Sturtevant, civil engineers; Mr. G. W. Sturtevant assisted by G. H. Todd, being directly in charge.

The annual cost of operating the works is estimated at about $2,500; and the cost of extension at $1.75 per lineal foot for 8-in. mains and $1.50 per foot for 6-in. mains.

BALTIMORE HARBOR.

The annual report of the Harbor Board, for 1883, of the city of Baltimore, notes as the conspicious fact of last year's work, the direct and deep channel communication with the ocean at the mouth of Chesapeake Bay. This channel is in the main 200 ft. wide, and no where less than 180 ft., it contains 27 ft. of water, in depth, at mean low tide. The total dredging, by the city of Baltimore, during 1883, covers an area of 50 acres, and aggregates 253,267 cu. yds.; its cost was $47,525.84.

An expenditure of $105,000 is recommended for 1884, to deepen and restore channels, for removing shoal off Fort McHenry and general repairs.

The U. S. Government has maintained, under Col. Wm. P. Craighill, U. S. Eng's., a powerful fleet of excavators at work during 1883; 3,000,000 cu. yds. of material have been removed within the year by them. The resulting channel, from the mouth of Baltimore Harbor to the deep water of the bay, is 17 miles long, 200 ft. wide and 27 ft. deep at mean low tide. The width of channel will no doubt be increased by the government, requiring Baltimore to do the same.

From the report of the Engineer of the Harbor Board, Mr. N. H. Hutton, we notice that the bids for dredging in Baltimore harbor, ranged from 16 to 25 cts. per cu. yard, for widening channel to 75 ft. and deepening to 15 ft. at low water. The average amount paid dredging contractors for 1883 was 18½ cents per cubic yard; the average depth of cutting over 50 acres, was 3 ft. 3½ in. The lowest bidder for the new wall city dock, a stone bulk head 6 ft. high, on a timber and pile foundation, was W. R. Weaver, at the following prices: Price per 100 ft. of wall for all excavation and grading, $1.75; price for yellow-pine piles, driven and cut off, per pile $3.80; for oak piles, same, $5.50; price per 1,000 ft. B. M. for all timber and workmanship, $22.00; price per pound for all iron used, 3¾ cents; price per cubic yard for masonry laid, $5.25; per lineal foot for coping, $2.00.

THE MERSEY TUNNEL.

This remarkable work now drawing to a close, is intended to join the commercial city of Liverpool and the south-west portion of Lancashire, with the city and docks of Berkenhead, and the Chester & Birken Railway. This union will also afford an outlet to all the region traversed by the railroad lines of Cheshire and North Wales.

The Mersey, which flows between Liverpool and Birkenhead, forms a fine river port, three-fourths of a mile in length, and advantageously used by several of the trans-atlantic steamship lines, such as the Cunard, White Star, and others. Upon each side of the river the banks are cut up by a series of docks those on the Birkenhead side alone costing about $30,000,000. The Liverpool docks are famous the world over, and extending a distance of seven miles, cost twice the above amount. These docks, both at Liverpool and Birkenhead, are under the control of a powerful corporation; and their magnificent basins and vast store-houses form a gigantic entrepot for the commerce of the world. Liverpool and its suburbs have now a population of 700,000, and better means of transporting travellers and merchandise from one bank of the river to the other had become a necessity.

The local authorities attempted to accommodate the demands of passengers and freight by establishing steam ferries, and transfer-barges for the railways, but found both systems to interfere more or less with the traffic upon the river.

Several projects had been submitted, from time to time, for a bridge across the Mersey, and a tunnel under it. In 1868 the Mersey Railroad Co. was organized under act of Parliament, and among the first directors were Mr. Robertson Gladstone and Mr. Harold Littledale. After considerable delay, this enterprise, of national importance, was put into practical shape in 1879.

In the early part of 1880, work was actually commenced by sinking a shaft at Woodside (Birkenhead) and another at St. George's Dock (Liverpool). These shafts were sunk through solid sandstone to a depth of 180 ft. and were intended to drain the tunnel which had to pass for about 4,264 ft. under the bed of the river. Powerful pumps, capable of handling five or six thousand gallons of water per minute, were put into the shafts on each side of the river. The rock was a red sandstone, sufficiently compact for building purposes; at no place is there less that 24½ ft. of this material between the intrados of the tunnel and the river-bed, the average thickness is 23½ ft.

Mr. John Waddell, of Edinburg, is the contractor for building the tunnel; the engineers of the company are James Brunlees and Charles Douglas Fox.

The greatest depth of water in the Mersey at this point is 92 ft. at high tide; at low tide it is 69 ft. The width of the river over the tunnel is about 4264 ft. The tunnel is semi-circular in form; the radius of the arch being 13 ft. 1½ in., the radius of the side walls is 24 ft. 7 in., and of the invert 39 ft. 4½ in.

Upon the Birkenhead side the progress has been especially rapid. The boring-machine of Col. Beaumont was in use here; it was the same machine, in character, as that used in the Channel Tunnel, but as the sandstone of the Mersey was harder than the chalk there encountered, the speed of the machine was materially reduced. A locomotive driven by compressed air, invented also by Col. Beaumont, was used in transporting the rock to the bottom of the shaft. The Beaumont machine cuts upon a diameter of 7 ft. with great rapidity, the speed obtained permitting an advance of about 100 ft. to be made per week. In nine minutes it makes a circular cut in solid rock, 1½ inches deep, and 7 ft. in diameter. The machine is moved by compressed air, and the boring head makes three revolutions per minute. If the work was continuous during 24 hours at the above rate, the total progress would be about 46 ft. per day. Practically, the general progress is 88½ ft. per week.

The Birkenhead Station, which is under Hamilton Square, is finished; it is 410 ft. long. There are now 820 men and 136 horses employed upon the works at this place.

The operations on the Liverpool side are continued day and night in the ordinary manner; the excavation being done by drilling and blasting, the masons closely following the miners The tunnel is lighted by the Hammond-Bush electric light.

At a distance of about 164 ft. from the shaft there will be, under James street, a station for passengers, where access can be had to the tunnel by hydraulic elevators, the depth being about 98 ft.

The cross section of the tunnel is 25½ ft. wide by 33½ ft. high; at the station the distance between the side walls is 50 ft.; allowing room for two platforms 410 ft. long each.

At James street, the tunnel is extended in the direction of the Central Station, the conditions permitting the construction of an underground depot at that place.

THE HONIGMANN SODA-BOILER.*

There comes to us from Germany a neat invention by Mr. Honigmann of Greoenberg, who has designed an entirely original locomotive, the boiler of which heats its water without the least particle of combustion. The boiler is filled with water at, say 100° C (212° Farenheit). In a short time it is found to have acquired, all by itself a temperature of 140° C [284° F]. This machine has been for some time on trial on the tramway from Berlin to Charlottenberg.

If we take a highly concentrated solution of caustic soda, and add water to it, as the solution becomes more and more diluted, the temperature of the mixture rises, a process which will continue until the solution becomes quite weak. In brief, the absorption of water by the soda develops heat. This fact is well known, but until this time no use was made of it, It occurred to Mr. Honigmann, who manufactures soda by the new ammonia processes, to apply this method to heat the water of steam boilers.

Everybody knows the "fireless locomotive," (see ENGINEERING NEWS, Feb. 22, 1879,) invented in America in 1872, by D. Lamm, and perfected in France by M. Franeg. The principle of it is very simple. Before starting, the boiler or reservoir is filled with water heated to about 200° C. [392° F.]. This cools very slowly and yields steam at a pressure of 15 atmospheres [220.8 ℔ sq. inch] which by means of an expansion chamber, can be reduced to about 5 atmospheres [73.6 ℔. sq. inch] at which pressure it is admitted into the cylinders. By this means the locomotive can run during the time that the temperature of the water in the reservoir is falling from 200° C to 150° C. [392° to 302° F.]. Here we have a locomotive which runs without a fire box, without fire, without smoke or noise. Such a machine will draw 8 tons at a speed of 12 miles an hour, over a line about 11 miles long. On the line from Rueil to Port Marly, a Franeg locomotive draws its ten tons over grades of 3 per cent. and even hauls a car with 30 passengers over a grade of 6⅞ per cent.

In this system, which has been tested for many years, the length of run is limited by the slow but progressive lowering of the temperature of the water in the reservoir, the steam losing its pressure little by little, until it is reduced to the limit, 5 atmospheres.

In the system of Mr. Honigmann neither temperature nor pressure is lost, for every loss of pressure causes a rise in temperature—what is lost on one side is gained on the other—up to a certain limit only, it is true, but the advantage is, nevertheless, very evident.

Mr. Honigmann constructs his hot-water reservoir with a double shell, the intermediate space containing a concentrated solution of soda. The steam, after acting upon the pistons of the machine, instead of exhausting into an ordinary condenser, is turned into the space containing soda. The soda solution absorbs the steam and takes up its heat, and the *hydration* of the soda also develops additional heat.

Thus the water in the boiler not only maintains its temperature, but at the commencement, rises to a much higher degree.

An apparent paradox—it is the exhausting, that is to say, the cooling of the steam, which develops heat, and consequently provides for a new exhaust of steam. We would thus have perpetual motion, if the hydration of the soda continued indefinitely.

Under favorable circumstances the solution of soda stands at a temperature about 10° C. (18° F.) above that of the water in the boiler.

When the solution has become reduced by the injection of a large quantity of steam, its absorptive power is diminished, its boiling point is lowered so that, in turn, itself is vaporized, and its part is played. The dilute soda solution must be replaced by one more concentrated. Nevertheless, the same soda is used over and over, being re-concentrated in a fixed boiler. The cost is not great, but it takes a little more coal than it does to produce the steam directly.

The following table gives the boiling point corresponding to different degres of concentration of the soda solution, and the corespondding steam pressures.

Quantity of water to 100 parts of mono-hydrated soda.	BOILING POINT.		Relative pressure of steam in atm'spheres
	Centigrade.	Fahrenheit.	
25	203°	406.4°	
30	200°	392°	
35	192.5	379.5°	12.1 atm'sph'rs
40	185.5	3[illegible]6	10.2
45	179.8	35[illegible].5	8.8
50	174.5	346	7.7
55	170.3	33[illegible].6	7.0
60	166	331	6.1
65	162.5	324.5	5.5
70	159.5	319	5.1
80	154	309.2	4.2
90	149	300.2	3.6
100	144	291.2	3.0
140	130	26[illegible]	1.6
180	122.5	252.5	1.2
220	117	242.5	0.75
260	113	235.4	.75
300	110.3	230.6	.40

Experience has developed the curious fact, that it is frequently unnecessary to fill the reservoir with super-heated water, as the operation of the machine heats it. With a solution of soda in 20% of water the temperature is raised more than 50° C. (90° F.) solely by the hydration of the solution. If the reservoir is filled with water at 100° C. (212° F.) in the air, in a few minutes the temperature rises about 150° C. (302° F.) and supplies steam at a pressure of 4 or 5 atmospheres. It is especially in this case that the machine heats its own boiler.

*Translated for ENGINEERING NEWS from the *Journal des Debats*, by WILLIAM R. HUTTON, M. AM. SOC. C. E.

Mr. Riedler, of Munich, has made continuous experiments for two months with the Honigmann soda-boilers, with favorable conclusions. We give one experiment with a small locomotive. It ran for one hour, drawing 17 tons, making 19 double trips or 3,040 metres (1.8) miles). It then drew two empty cars weighing 13 tons, 63 double trips or 10,080 metres (6.26 miles). This trial shows the considerable capacity for work of the soda-boiler; for these loads were drawn during four hours, with a single supply of soda. The charge of soda was at the start 733 kilog. (1616. lbs.) containing 15% of water. At the end the weight was 1120 kilog. (2469. lb) with 43.89% water. The quantity of steam injected into the solution was 377 kilog. (831. lb)

The precise economy of this method cannot be stated. We gain in length of run for the same load of water carried, and in weight hauled. We lose a little in cost of condensing the soda-solution—for while a pound of coal evaporates six pounds of water—it will evaporate in the same boiler but 5 $\frac{5}{10}$ pounds of soda-solution.

Ordinary fireless locomotives must carry twelve times as much water as the weight of steam to be used. If 600lbs. of steam are needed per trip, the machine must carry 7,200lbs. of water at high pressure. The soda machine need carry but 600lbs. with a reserve of about 400lbs. in addition to about 800lbs. of soda in a reservoir of thin plates, in which the pressure never exceeds one atmosphere. Under these conditions the Honigmann locomotive would weigh but 10,000lbs. against 22,000lbs. of the usual type. It can therefore draw twice the load or run twice as long with the same gross load.

The soda boiler is clearly adapted for use on underground roads, for mining and tunnel work, and for city tramways, in short for every place where it is desirable to do away with the exhaust, and run without noise. Where water is scarce it may be advantageous to replace the ordinary boiler with a soda boiler.

Although the invention was born but yesterday we may hope well of its future. Many boilers have been built, and it is being tested, not only on the tramway from Berlin to Charlottenburg, but in the boats of the Berlin Steam Navigation Company, in mining locomotives for the Society of Mines of Hoegen, and others. We await now the verdict of experience.

PERSONAL.

EDBROOKE & BURNHAM, architects, of Chicago, are the successful competitors for the plan of the new Georgia capitol.

MR. E. BROUGHTON, formerly general manager of the Great Western Railway of Canada, and more recently Government Inspector of Railways of the Dominion of Canada, has received the appointment of Vice-President of the Chicago & Alton road, to succeed Colonel J. Condit Smith, who died several months ago.

THE Swiss naturalist, ARNOLD HENRY GUYOT, Ph. D., LL. D., Blair Professor of Geology and Physical Geography, and Senior Professor of Princeton College, died at his residence in Princeton, N. J., Friday, aged 76 years. He was elected to this chair in 1854. Prof. Guyot was born at Neufchatel, Switzerland, September 5, 1800. His wife, the daughter of the late ex-Gov. Haines, survives him.

CAPT. PAUL BOYTON, the swimmer, says that he has given up making voyages. He has traveled over 25,000 miles in his navigating apparatus, and there were not many places left for him to visit. He is now devoting himself to sub-marine engineering, removing obstacles to navigation, etc. He has spent some time in the service of the Peruvian Government during the late war, laying torpedoes. Now he proposes to remain permanently in New York. He was married this week to Miss Maggie Connolly of Chicago.

A. S. MATHEWS, ex-Superintendent of the New York, Providence & Boston Railroad, one of the best known railroad men in New England, died at Stonington, Conn., on the 8th. He was born in Maryland in 1814, and when 16 years old was employed as civil engineer to assist on the Baltimore & Ohio Railroad, and later on the Harlem, Paterson & Hudson, the Boston & Providence, the Boston & Albany and the Taunton Branch Railroad. In 1836, Mr. Mathews entered the service of the New York, Providence & Boston Railroad, and from then to his death occupied a responsible position. In 1848 he was elected Superintendent and resigned on account of ill-health in 1878. Since then he has been Chief Engineer of the company.

MR. ROBINSON of the Mexican Central has made a number of important changes in his staff. His principal appointments thus far are as follows: R. E. BRIGGS, Chief Engineer, headquarters at Aguas Calientes, in charge of engineering construction and maintenance; F. E. NELSON, Superintendent of Road Department, headquarters at Aguas Calientes, in charge of track laying, construction, maintenance of bridges, buildings, water service and repairs of track; W. G. NEVIN, General Material Agent, headquarters at the City of Mexico, in charge of all material, store and stationery; R. E. COMFORT, Division Superintendent between the City of Mexico and Silao, headquarters at the City of Mexico; G. J. JARVIS, Division Superintendent between Silao and Fresnilo, including the Guanajuato branch, headquarters at Silao; GEORGE C. CLEVELAND, Fuel Agent, headquarters at Aguas Calientes.

MR. WILLIAM HASELL WILSON, who has been selected to fill the place in the Pennsylvania Railroad, vacated by the death of the late Strickland Kneass, has been elected to the presidency of the Philadelphia and Trenton, Belvidere, Delaware and Philadelphia and Erie Railroads, and has also been made a director in several of the New Jersey corporations controlled by the Pennsylvania Railroad Company.

Mr. Wilson is one of the oldest officers in the service of the company. A civil engineer by profession, he was intimately associated with the late J. Edgar Thomson in surveying and locating the line of the Pennsylvania Railroad from Harrisburg to Pittsburg. After the completion of the road he became division engineer, and subsequently chief engineer of the main line from Philadelphia to Pittsburg, being located at Altoona. In 1870 Mr. Wilson was transferred to Philadelphia as chief engineer of construction and consulting engineer, being placed in charge, under the President, of all construction work and important improvements then in progress along the line. For several years past he has, in addition to his duties as consulting engineer, acted as real estate agent, having full charge of the records of the company pertaining to all real estate matters, the payment of taxes, etc.

The position of real estate agent, made vacant by Mr. Wilson's promotion, will, after March 1, be filled by Mr. John C. Wilson, who has for several years past held various responsible positions in connection with the Pennsylvania Railroad Company, and more recently as assistant to Chief Engineer Brown.

OBITUARY.

PROF. CHARLES A. SMITH, late of Washington University, St. Louis, died in Newburyport, Mass., on February 2. Mr. Smith was born in St. Louis, April 8, 1846, but spent his early life in Massachusetts, and graduated at the Institute of Technology, in Boston, about 1867. Selecting engineering as a profession; he was for a time connected with Mr. Francis, at Lowell, and Prof. Henck, in Boston. He was also engaged in railroad work in North Carolina and upon the Union Pacific in Utah. The St. Charles and the Hannibal Water Works, and the machinery for the Richmond, Va., works were designed by him.

Prof. Smith was a member of the American Society of Civil Engineers, and for twelve years Secretary of the Engineer's Club at St. Louis. He was also a member of the Association for the Advancement of Science, and of the American Association of Master Mechanics.

NEW PUBLICATIONS.

THE DEAN BROTHERS' STEAM PUMP WORKS of Indianapolis, have issued a neat catalogue for 1884.

The detail and different classes of pumps manufactured by them are fully illustrated and described, and prices given.

They furnish a list of some eighteen towns and cities now supplied with their pumping machinery.

"PATENTS ON INVENTIONS—A Quarterly Patent Review, containing information and advice for Inventors, Patentees and Manufacturers," vol. 1. Henry Connett and Arthur C. Fraser, authors and editors, New York 1884.

This book, while it is in fact intended to advertise and extend the business of its authors, who are Solicitors of Patents, contains a vast amount of information useful to the class to which it is addressed. The work itself is very attractive in appearance and reflects credit upon the taste and enterprise of its publishers.

A TREATISE ON THE COMPOUND STEAM ENGINE, in two parts. Part I by JOHN TURNBULL, JR., with Method of Finding the Relative Cylinder Volumes; revised with additions. Part II, GRAPHICAL AND ANALYTICAL TREATMENT. Illustrated with Diagrams, Tables, Etc., Including Rotative and Pumping Non-Rotative Engines. By S. W. ROBINSON, C. E., Prof. of Mech. Eng., Ohio State University. D. Van Nostrand, Publisher. Price, 50 cents.

This is No. 8 of the science series republished As explained by the author, this volume treats only of the Woolf Compound Engine, or one in which the pistons move simultaneously, except in the cases given of pumping engines. Excepting in two cases, the engines may be rotative, that is, have a main shaft, fly-wheel, etc.

The treatment is by analysis, avoiding as much as possible, excessive complex formulas. The graphical method has been resorted to in treating of the effects of cushion, clearance and expansion, because formulas would involve too many terms, and be useless for practice.

Tables are given in Part I for finding the relative volumes of cylinders for equally dividing the work between the two cylinders, on the supposition of no receiver, clearance, cushion, superheating, reheating, fluid friction, or back pressure of exhaust.

ENGINEERS' CLUB OF PHILADELPHIA.

Record of regular meeting, February 2, 1884.

President Wm. Ludlow in the chair; 44 members and 9 visitors present.

Mr. Wm. Lorenz presented a comprehensive discussion of steel and iron railroad ties, illustrated by numerous full-sized models and drawings.

Mr. C. J. Quetil, introduced by Mr. J. J. de Kinder, gave an illustrated description of his wire truss railway.

President Wm. Ludlow exhibited specimens of obstructed water pipe, discovered in his practice, and explained the chemical causes which led thereto.

Mr. J. Milton Titlow exhibited and described a full set of general and detail drawings for the proposed stone bridge over the Schuylkill river at Market street, Philadelphia. As the cost thereof is estimated at $1,200,000, in the discussion which followed, President Ludlow suggested the alternative of building two $600,000 iron bridges therewith—one at Market street and one at Walnut street, over the Schuylkill, the latter bridge being very greatly needed at this time.

Mr. E. F. Loiseau presented a description of the process of manufacture of Portland cement by the application of his solidifying apparatus.

Mr. Robt. W. Lesley, visitor, supplemented Mr. Loiseau by explaining the difference between the old and the above-mentioned methods in actual practice.

THE SEWERAGE OF KANSAS CITY.*

The Separate vs. The Combined System.

BY OCTAVE CHANUTE, M. AM. SOC. C. E.

The importance of the selection of an adequate system of sewerage and drainage upon the health and fortunes of a city, cannot well be overestimated. Not only does it involve the expenditure of vast sums of money, but more precious still, the welfare and health of the citizens depend upon the wisdom of the selection, and errors once committed are, if not impossible, at least very difficult to correct. Indeed, the more the subject is considered the more its importance grows upon the minds of those who, like the audience that I now see before me, are interested in the prosperity of the city. I therefore hope that what I have to say will be critically received, so that whatever is sound may result in good, and whatever shall be erroneous may be eliminated.

Nearly two years ago, upon a very brief visit to Kansas City, and before I had come back to reside among you, I became aware that it was proposed to adopt what is known as the "combined system" of sewerage. I thought that this would prove to be a mistake, and feeling a great interest in the welfare of the city, I asked a few citizens and the reporters of the public press to meet me one evening, when I laid before them, chiefly what others had said upon the subject of sewerage, and upon the dangers to health of an improper selection. I endeavored to point out that not only would the "combined system," so called, be very much more expensive than what is known as the "separate system," but that if we judge by the experience of other cities, it would also largely increase what physicians call "zymotic" diseases, such as typhoid, diphtheria, scarlet fever, etc., a class of diseases from which Kansas City has hitherto been happily remarkably free, and which are supposed to be produced by imperfect ventilation and drainage and especially by the exhalations of large sewers.

At that time there were, if I remember rightly, about four and a half miles of sewers in the city, while at the present time there must be over twenty miles, so that enough has been done in the meantime to give us some data by which to form a judgment as to the soundness of the reasoning which was then advanced, and if we distrust the experience of others, at least to give us some experience of our own.

Since my return to the city I have been endeavoring to inform myself as to what the facts really are, and I find that there is a general impression that the city is not as healthy as it was in the early days of its history. I have been informed by some of the leading physicians that there has been an increase in zymotic diseases (the much dreaded scarlet fever, typo malaria and diphtheria), and that they show a marked difference in type from the same diseases as they existed in the days before sewers, but that in few cases only have they been traced directly to the effect of the sewers, or to defective plumbing. Other physicians again, while admitting an increase in zymotic diseases, attribute it to the increase of population, or to the turning up of the soil while carrying on public improvements in various parts of the city.

As vital statistics have been kept here much too short a time to permit of any comparisons being made, or to form the basis of an actual demonstration of the effects of the sewers, I must abstain now from making a positive statement upon this branch of the subject, but I hope that the physicians of the city who, both from their experience and scientific training, are the persons best fitted to reach sound conclusions on this subject, will favor us with their opinions and with the actual facts occurring within their knowledge.

Upon one point, however, I believe all persons are agreed, and that is, that with a separate system of sewers in which the house refuse should be confined by itself in small pipes, daily flushed for their whole length by automatic means, there would be no chance for the development of the so-called sewer gas and no danger of infection from that source. All believe, therefore, that whether the "combined system" is really as dangerous as has been represented by sanitarians elsewhere or not, the "separate system" would certainly be safer.

This brings us to consider in what respects these two systems differ from each other, and why the one should be thought to be unhealthy, while the other is admitted to be safe. Some persons seem to have an idea that the subject is intricate and mysterious and the two systems differ in the same way as do two complicated designs for different purposes, or two plans for some intricate machine. In point of fact, however, no subject is simpler or more easily understood, and the only difference in principle between the two systems, is that in the "combined system" the water, which comes from the occasional rains, the "storm water" so called, is admitted into the sewers, along with the house refuse, while in the "separate system" the house refuse alone is carried away by one set of pipes (which are daily flushed), while the storm water is carried away partly in open gutters, and partly (whenever it accumulates to such an extent as to cause annoyance) by another set of underground sewers.

*An address read before the Academy of Science, Kansas City, Nov. 30, 1883.

This is all the difference there is in principle between the two systems, but this difference, simple as it is, involves several important consequences.

The first is that the large sewers, in the combined plan, have to be carried along of the full great size required by the storm waters, under every portion of the district to be drained, instead of being confined as in the separate system, to those short sections where the storm water accumulates enough as to prove objectionable. It will readily be understood that this will largely add to the expense; for once the storm water and house refuse are mixed together in a sewer, we no longer dare to admit them to the light of day, until they are clear of human habitations.

The second consequence is that the combined sewers must be made large enough to pass at the same time both the storm water and the daily sewerage, and the further consequence is that during at least nine-tenths of the time (for I do not suppose that in this climate it rains anything like one-tenth of the time) the sewers are not more than one-twentieth full, while on the other hand they are not unfrequently overtaxed during the remaining one-tenth of the time, by our semi-tropical rains.

It may be questioned here in passing, whether the peculiarities of the climate of Kansas City have been taken sufficiently into account, in carrying out the system of combined sewers. They are proportioned, as I understand it, upon the rule of allowing for a rainfall upon the drained district, at the rate of an inch per hour. This is an English rule, and a very proper one in that climate, where it rains nearly every day, but seldom violently. Here, where for weeks and perhaps months, we sometimes do not get a drop of rain, and where, when it does come, it sometimes pours down three or even four inches in an hour, sewers proportioned by the English rule may prove both too large and too small—too small to carry off the occasional semi tropical shower, and too large, much too large, to be properly ventilated through the openings which it is practicable to make.

The result necessarily must be that during at least nine-tenths of the time the Kansas City sewers will be nineteen-twentieths full of noxious gases, which physicians tell us are dangerous to life. We may, perhaps, keep these gases out of our houses by perfect plumbing but to me it seems far wiser to prevent their production by breaking away from tradition and adopting what I consider as a more appropriate and rational system of sewerage for this city.

It must, however, be admitted that at first consideration the combined system of sewers seems a perfectly plain, obvious and sensible method to adopt. There is a certain amount of house refuse or sewerage and a certain amount of storm water to be carried off, and what can be more obvious than to provide one single sewer to do it all. We have been laughing for a good many years at the Pennsylvania Dutchman who cut two holes in his barn door, one for the cat and the other for the kitten, and we may fancy that we would be equally the objects of ridicule if we were to imitate his conduct in planning our sewers.

I hold, however, for myself that the Dutchman was right in cutting the two holes, if it was necessary that the cat and the kitten should go into the barn at the same time, and that is precisely what occurs when we have a rain storm. The storm water has to be taken care of and the house sewage has to pass through the sewers at the same time. Moreover the combined system has all the weight of precedent and all the prestige of great antiquity. It is more than 2,000 years since men have been building sewers and it is natural that when modern engineers tell us that the storm water and the house refuse should be separated we should hesitate to innovate upon what we suppose to be a venerable practice, sanctioned by the experience of so many centuries.

I confess that in my own case, when the subject first came to my notice, some three years ago, I questioned seriously whether the proposition did not contain somewhere a fallacy—whether in course of time some hidden defect would not be discovered in the separate system which would result in its abandonment.

In point of fact, however, we are not now using our sewers as did our ancestors, and the combined system is really of modern origin. Sewers were originally built for storm water alone, at those points where it became a nuisance, and what we now consider as sewage proper went into cesspools, to be periodically removed by hand. In England it was illegal to use the sewer for household purposes up to 1815, and it was only in 18.7 that the latter use was made compulsory. The result of this combination has been so unsatisfactory that the English sanitarians and engineers have been experimenting with all sorts of devices to obviate or mitigate the evils thus created. This may be enlarged upon. In France it is still the rule that sewers shall serve for storm waters alone, and a distinguished French engineer, M. Lavoinne, in giving recently an account of the Memphis systems of sewers, says: "It is to be noted that the system which we have described, is precisely the inverse of that which is generally practiced in France, where the principal office of the sewers is to carry off storm waters and where they are made large enough to be traversed by the workmen who are to clean them. Moreover, in Memphis the system is connected with all the house closets, the solid product of which is generally with us excluded from the sewers."

This matter has created a great deal of interest in France, and to give a better idea of the positions taken by French engineers, I will read the following translation of engineer Lavoinne's conclusion upon the subject, to-wit: "The immediate disposal of all excreta, whether liquid or solid, coming from dwelling houses, is evidently the best method of guarding against danger, from a sanitarian view. If this disposal is made through a sewer of sufficient section to pass both these excreta and the storm waters, it will be subject to all these variations which may result from the intermittency of the storm water, which will generally run too slowly to carry away the solid matters, unless indeed a sufficient volume of water can be artificially obtained to flush the sewers or even to provide a constant subterranean current of water, more or less clean.

"The establishment of a special outlet for the offensive matter alone, the volume of which varies but little, in order to insure their speedy disposal under conditions peculiarly appropriate to their volume and nature, not only possesses the advantage of much better satisfying the demands of sanitation, but it admits of a much better use of flushing waters by avoiding the admixture of a portion of water, which is often unnecessary, and which sometimes has to be carried away a considerable distance at great cost in order to get rid of it, solely because it has been contaminated by sewer water.

"In the large sewers of our most populous towns, and in which the water-supply pipes are generally attached, the insertion of other pipes, for the purpose of carrying sewage alone, and communicating by branches with dwelling houses, seems a satisfactory solution, in consequence of the small sizes required, of the problem of the drainage cesspools, which it is still dreaded in France, notwithstanding the example of neighboring countries, to connect with the public sewers. The expense of the special pipes to be introduced into the houses for that purpose would be more than offset by the expense of periodically cleaning the cesspools, frequently to the detriment of the public health, and by the elimination of the permanent dangers of infection, which the decomposition of the decayed matter presents."

Living as we do in a new country, we do not realize how modern, (nor how great, comparatively), are the conveniences which surround us in our houses. Neither do we realize how these conveniences affect the plans which were found sufficient by our ancestors. For instance, in a little treatise on hydraulic engineering, published in 1853 by an English engineer, I find it stated that it was but a few years since the supply of water to private consumers was effected in all countries upon what is called the intermittent system, and that the constant, "high pressure" system, which is the only one we know in this country, was considered as an innovation which was not free from objection, on account of the resulting waste.

Now it is doubtless a great convenience, one with which we would not part for any consideration in this country, to put water on tap in nearly every room of our modern houses, but it results in cutting an equal number of openings to the sewer, and every stationary washbowl, bath or closet opens the way for the entrance of sewer gas, while the men, who less than a century ago combined storm water and domestic refuse in the same sewers, had one, or at most two such openings to guard in their houses, and in the majority of cases none at all, as the water was drawn from some hydrant in the yard, and all the slops emptied by hand in some out-door sink.

It is evident that these multiplied openings to the sewers must prove increased sources of danger if gases are allowed to be generated, and that when storm waters are admitted to the sewers, the hydraulic ram resulting from a flood, must produce pressure in the sewers, and drive the gas into the houses. The difficulties and dangers connected with a combined system of sewerage seems to have been recognized in England soon after their introduction which, as already stated, dates from about 1815, for in 1842 Mr. Edwin Chadwick, an eminent sanitarian, proposed and advocated a separate system of sewerage which has since been supported by many eminent engineers, upon sanitary grounds. This separate system has been successfully introduced in several English towns, and that it has not been more rapidly adopted is probably due to one imperfection in the system as carried out in England, which results from the introduction into those sewers which carry off household waste of a part of the storm waters, that which falls upon the roofs and yards, (while that which falls upon the streets is rigidly excluded) for the purpose of flushing and cleansing the sewers.

It was reserved to an American sanitary engineer, Mr. Geo. E. Waring, jr., to finally perfect the separate system of sewerage, by excluding all of the storm water, which latter cannot be relied upon to flush the sewers regularly, and substituting therefor an automatic flush tank, which, filling itself slowly by a spigot from the water supply, discharges itself suddenly and flushes the sewers once or twice in twenty-four hours, as may be desired.

I will not now take up your time with a description of the separate system, to which the name of Mr. Waring

has been justly attached. This description has been so often given by the public prints that you must all be familiar with it, but I will say that as carried out at Memphis by Mr. Waring, it is less a new invention (about the permanent efficacy of which there might then be some question) than an outgrowth and combination, made with great good judgment, of several excellent feature that had been previously tried and been successful.

Many of you have very recently been in Memphis, and while there you doubtless inquired into the working of its system of sewerage. It seems to be the universal opinion that the system there is a perfect success, that it accomplishes every object that was aimed at, and has transformed this fever-plagued spot into a healthy city, while four years of constant use have not developed a single hidden fallacy in the system or marred the unanimous satisfaction of the citizens; and this, as I am informed, in spite of the fact, that (contrary to the general belief on the subject) much of the work was originally hurriedly and badly done, so that it ought to show all the defects which generally result from bad workmanship.

The general result, so far as ascertained, therefore, is that the separate system at Memphis is a complete success, that it has not failed in any particular to accomplish all necessary purposes, and that it is giving very general satisfaction to the citizens.

Ask yourselves now the question, whether the citizens of Kansas City are equally well satisfied with the results of the combined system? I am afraid from the answers which I have received in private, that such is not the case.

And yet, as it seems to me, no city is so well adapted as Kansas City, to the successful introduction of the separate system. The grades are steep and the slopes are short, so that storm water can be quickly and cheaply gotten rid of by open gutters, combined with a few storm sewers, and in our climate the rains are needed to wash the streets. We have a light, dry soil, admirably drained naturally so that one of the three offices which are performed by the combined sewers, that of draining the adjoining soil of water (at the expense of occasionally polluting it with sewage) through the crevices in the work, will not be required, or if required, will be better done by laying tile drains in wet places, along with the sewers proper, as was done in Memphis. So that every consideration of expediency, of health and of economy points to the adoption of the separate system for those parts of Kansas City which are yet unprovided with sewers.

There are also special reasons why the separate system is the best adapted to the needs of this city. In a rapidly growing town, where we are constantly building up and digging down, where the streets are being constantly disturbed, and where we have the hurly burly which so astonished our late Mexican visitors, it is almost impossible to prevent the intrusion into sewers, to which storm water has access, of all sorts of debris and incongruous materials, which are pretty sure to obstruct the sewers, if not to choke them. If there are, therefore, anywhere good reasons for making storm water sewers large enough for men to go into them to clean them, (and as we have seen, this is the French practice) certainly those reasons exist in Kansas City.

Moreover, the combined system of sewers can be scarcely carried out much in advance of the grading of the streets, and of their paving and guttering. Otherwise they would probably become useless in consequence of the changes of grades, which are not altogether unknown here, or choked by the bringing in of earth and rubbish from the unpaved streets; while, if we adopt the separate system, it can, by being placed in the alleys, be at once carried out in advance of grading the streets, in all the parts of the town where sanitary reasons exist for them.

The lecturer here gave the following estimates of cost:

ON PRESENT BASIS.

Cost of 307 acres sewered December 31, 1882	$ 314,914
Cost of 2,630 acres to be sewered at $1,026	2,617,600
Total	$2,932,514

POSSIBLE MAXIMUM ESTIMATE.

Cost of 307 acres sewered Dec. 31, 1882	$ 314,914
Cost of 2,600 acres to be sewered, at $653.40	1,698,840
Total	$2,013,754

ESTIMATED COST SEPARATE SYSTEM.

Cost of 307 acres sewered December 31, 1882	$ 314,914
Work done during 1883, say 100 acres at $700	70,000
Cost of 2,500 acres to be sewered at $217.80	544,500
Cost of storm water sewers to be built hereafter	150,000
Total	$1,079,414

So we may say, in round numbers, that it is yet possible to save a million of dollars to the city, by adopting the separate system of sewerage for the portions not yet undertaken.

It will be noticed that in the foregoing estimate the sum of $150,000 is allowed for storm water sewers to be built at points where the accumulation from the gutters proves to be a nuisance, I do not believe that there will be many such points. In Memphis there are said to be none at all, but even if we had to double or treble that estimate, we shall still realize a notable economy over the cost of completing the present system.

Let us even assume the very worst possible supposition, one which is nearly impossible, that the storm water shall prove in time such a nuisance, over all parts of the city, that we shall be led to underlay every portion of its site with another set of sewers for storm water alone. It will certainly be admitted that this contingency is remote, that it will not occur for many years, and I will ask whether it is not better, even in that extent to construct now a set of cheap sewers for sanitary objects alone, even if we have hereafter to encounter the full cost of another set to provide for storm water alone, which, be it remembered, may produce annoyance, may wet the feet of passengers, render crossings impracticable for a short time, or even occasionally tear up gutters, or flood a cellar, but which cannot endanger health or life, as we are led to believe by sanitarians the combined sewers do.

The case then stand thus: Memphis has been the first city in this country to adopt thoroughly the separate system of sewerage, as improved, designed and combined by Mr. Waring. It is thoroughly satisfied with the result, the city has been reclaimed from the unhealthiness which scourged it, and during a four years' experience no hidden fallacy or defect in the system has appeared.

On the other hand Kansas City has begun to carry out the combined system, and after three or four years of experience is not satisfied with it.

The combined system is said by sanitarians to involve grave dangers to public health, while the most that is claimed by its advocates is, that if proper precautions be taken it is not so dangerous after all. On the other hand, the separate system is free from the slightest taint of suspicion. It is universally admitted to be healthy and safe.

Kansas City can even now probably save $1,000,000 by adopting the separate system for the portions of the town as yet unsewered, and even if this should not turn out to be true, even if a second set of sewers shall be needed some day, it is clearly better to carry out what is within our reach now, to adopt a cheap system which can at once be extended to all parts of the city in need of it, and to trust to the future resulting prosperity to enable us to pay for the luxury of passing our storm water underground.

But, in point of fact, it is not true. It is in my judgment impossible that a second set of sewers, for storm water alone, shall ever be needed under all parts of our city, so that every consideration of economy and of sanitation points to the adoption of the separate system for the future.

CORRESPONDENCE.

High Wooden Viaducts and Trestles.

Special Correspondence Engineering News.

MEADVILLE, PA., Feb. 8, 1884.

EDITOR ENGINEERING NEWS.—Have you anything in pamphlet form about High Wooden Viaducts and Trestles? Any information on this subject will be especially acceptable to

Respectfully yours,
ENGINEER.

[We beg leave to refer this inquiry to such of our subscribers as will favor us with a reply.—ED. ENG. NEWS.]

Ohio Society of Surveyors and Civil Engineers.

Special Correspondence Engineering News.

SECRETARY'S OFFICE,
URBANA, OHIO, Feb. 1, 1884.

EDITOR ENGINEERING NEWS.—The Fifth Annual Report of the Ohio Society of Surveyors and Civil Engineers is to be printed about the first of March, and as the membership of the Society includes Land Surveyors, Highway Engineers, Hydraulic Engineers, Bridge Engineers, Railroad Engineers, and Sanitary Engineers, as well as Architects, all of whom are continually buying not only such engineering instruments and office supplies as their business demands, but also such material as the improvements in which they are interested require, or else have the power of recommending or requiring in their specifications what material may be used, you are respectfully solicited and invited to insert an advertisement of your goods in the report.

The success of the society has been most flattering, and the thousand reports of last year's proceedings have been distributed through the States and Canada, until the supply is exhausted. Applications are already in for the Fifth Annual Report. Advertisers say that their venture with us has been satisfactory, inasmuch as the report reaches direct, just the class of men they wish to reach.

One thousand copies of the report will be printed, to be distributed among the members of the Ohio Society and those of kindred organizations in Michigan and Indiana, and also to advertisers; to other applicants, on receipt of twenty-five cents.

The advertising rates have been fixed as follows: Page, ten dollars; half page five dollars; professional cards, quarter page, two and one-half dollars; page 6x9 in. No advertisements on cover.

Thanking those who have favored the Society in the past, and hoping for a continuance of their dealings with us in the future, and that replies favorable if possible, will be received from all by the 20th of February, 1884, I am

Very Respectfully
BENJ. THOMPSON, Sec'y.,
Box 862, Urbana, Ohio.

BETTER DRAFTING PADS.

Special Correspondence Engineering News.

RUTGERS COLLEGE,
NEW BRUNSWICK, N. J. Feb. 9, 1884.

EDITOR ENGINEERING NEWS.—Draughtsmen who have used drawing paper pads know how convenient they are, I have had my students make use of them for a long time; in fact, when the idea of this pad-form first occured to me as desirable for drawing paper, it was necessary to have the pads made to order, as they were not in the market, and a prominent firm in New York would not make them except as they were ordered. I find that while they can now be obtained at any dealers in drawing materials, they are not so well made as formerly. They "curl." The reason, probably, is that the pasteboard back was too wet, relatively, when the sheets of paper were fastened to it. On drying, the back contracted more than the paper, and the drawing surface of the paper became convex. I have remedied this defect, in part, by cutting through the middle of the back a line parallel to the axis of curvature, or by separating the sheets from the back and then fastening them together properly. But what is needed is that the pads should be properly made at first, and the purpose of this communication is, if possible, to induce draughtsmen and draughting students to bring whatever pressure they can upon the dealers in these pads to have them so made.

ISAAC E. HASBROUCK.

KANSAS CITY SEWERAGE.

Special Correspondence Engineering News.

KANSAS CITY, MO., Feb. 4, 1884.

EDITOR ENGINEERING NEWS.—Having learned that your comments upon my lecture on the Sewerage of Kansas City, were based upon a brief and somewhat inaccurate report, I beg herewith to send you the full text of it, and to hope that you will find room for extracts therefrom in your paper.

I am interested in this matter, not only as an engineer, but as a taxpayer, and it would have saved me a considerable sum of money to have had the "separate" instead of the "combined" system, adopted for the sewerage of Kansas City.

It was stated by others, in the discussion which followed my lecture, that so far from there being an "annual charge" upon the Waring patents, the royalties amounted to a charge of some ten cents a lineal foot ($528), paid once for all, and that for the territory yet remaining to be sewered in Kansas City, this would amount to between $500 and $5000, while the saving to be effected was estimated by myself about $1,000,000.

Now, there are good reasons why the separate (commonly known as the Waring) system is not well adapted to the circumstances of at least some portions of Kansas City, it is desirable that they should be made known.

I beg, therefore, to invite the opponents of the separate system, to point out through your columns, instances of its failure, or valid objections to its adoption (with such improvements as experience suggests,) for portions of Kansas City as yet unprovided with sewers.

While as little disposed as other engineers to favor patented devices, or to carry out special forms of construction without regard to their applicability, I think it would be injudicious to incur an increased cost of $1,000,000 or even $500,000 (and save $5000) without some good reasons.

Respectfully,
O. CHANUTE.

[The full text of Mr. Chanute's letter is printed elsewhere in our columns this week. Our columns are open for a fair discussion of the subject of Combined vs. Separate Sewerage.—ED. ENG. NEWS.]

CANADIANS complain that American railroad men are rapidly securing the most important positions on the Canadian Pacific Railroad. On the western division of the road out of 14 principal offices 10 are held by Americans, including the General Superintendent, two Assistant Superintendents, Auditor and Superintendent of Bridges and Buildings. They have about half the best places on the other divisions.

TORONTO, Feb. 8.—The Toronto Underwriters' Association have decided, in view of the inefficiency of the water works and the fire department, to increase fire insurance rates 10 per cent. after March 31, unless the City Council in the meantime takes steps to obviate the causes of complaint.

NEWS OF THE WEEK.

Bridges.

THE total r ceipts since the East River bridge was opened up to Feb. 1, was $226,303.94. Of this amount the railroad earned $126,032, foot passengers paid $47,705, vehicles $52,322, and $244.94 was received in interest and for materials sold. The expenses during the same period were $179,343.68. The highest receipts from th railroad were for last week, when $8,703 was earned by the road. The total income for the week was $10,866, the largest ever received.

THE New York, New Haven and Hartford Railroad Company have given out the contract for a new wrought iron bridge to replace the present iron structure across the Housatonic River. A temporary bridge of timber will be erected about ten feet south of the present bridge over which trains will pass while the new one is building, so that travel will not be interrupted. The new structure will be about 1,100 feet in length, and will cost about $175,000.

Streets, Drainage, Sewerage, Etc.

ACCORDING to a late interview with City Engineer Knight of Kansas City, over seven miles of street paving will be done in that city during the coming year. The most of this paving will probably be of cedar block. Mr. Knight earnestly recommends the purchase of a steam roller by the city councils, so that macadamised roads can be built under proper and favorable conditions.

TORONTO, Ontario, Feb. 11.—The city Councils have resolved to apply to Parliament for power to institute an issue of corporation stock to the amount of $1,500,000, divided into 100 shares, to be known as the "City of Toronto drainage fund," for the purpose of establishing a fund for the construction of a thorough system of drainage and sewers, whic the city is at present badly in need of. The stock is to be issued under the signature of the Mayor, countersigned by the City Clerk, and sealed with the corporation seal, and to bear interest not exceeding 5 per cent. per annum, payable half-yearly, on April 1 and October 1.

SINCE the Boston improved sewerage system was put into operation on the first day of January, 1884, a careful inspection has been made of the disposition of the sewage matter which has been discharged at Moon Island on each of the ebb tides. The result has been that when the sewage reached Long Island it had become so dissipated that it was almost impossible to detect it, and in one instance only has it been possible to detect it as far as Rainsford Island. The conclusion thus arrived at is that before the flood tide the sewage had been rendered so harmless that no danger could be expected from any possible return of the same.

Contracting Miscellany.

THE contract for building the Zanesville, McConnellsville & Pomeroy Railroad, known as the Black Diamond System, was let recently to the United States General Construction Company of New Jersey. The road and branches make over 400 miles. The work will be begun about April 1.

HENRY Crawford, a well-known railroad man was made defendant in a Chicago Court to a $100,000 suit at the instance of Eugene E lery. The latter claims he was engaged with Crawford some time ago in building a railroad in Indiana, but that the latter failed to keep his promise in dividing the profits.

CONVICT Labor on the City Hall, Chicago.—Ald. Lawler stated that he understood that a contract for the completion of the new City-Hall, amounting to some $450000, was to be let shortly, and that a firm employing convict labor would be a bidder. He offered the following:

Resolved, That the Commissioner of Public Works be and he is hereby directed not to let any contract for marble or any other contract where said work is being done by or under what is known as the convict labor system.

The resolution went through—yeas, 27; nays, 6.

THE following are the bids opened January 22, 1884, for pumping machinery at Mare Island, Cal.:

James Edwards & Co., New York City, $74,250.

Union Iron Works, San Francisco, Cal., $50,600.

Southwark Foundry Company, Philadelphia, $47,900.

Daniel C. Buhre & Co., Brooklyn, $69,700.

Thomas C. Basshor & Co., Baltimore, $75,000.

Parke & Lacy, San Francisco, $42,200.

THE following bids were opened, January, 22, 1884, for floating gate or cassion at Mare Island, Cal.

Union Iron Works of San Fran isco, Cal., H. T. Scott, vice-president, $64,000.

Pacific Iron Works, Rankin, Brayton & Co., San Francisco, Cal., $72,500.

Risdon Iron Works, San Francisco, Cal., W. H. Taylor, president, $73,500.

THE contract for erecting the centre pier and abutments for the Rush street br dge was let the other day to Fitzsimons & Connell for $53,500.

STILLWATER, Feb. 5.—At a meeting of the Prison Building Committee held yesterday it was announced that the Wabasha firm of Luke & Alexander, to whom had been let the contract for building the prison workshops, declined to furnish bonds. The bid of this firm was $17,874, but they had decided that they could not do the work for that sum. Upon Mr. Radcliffe's announcement the committee awarded the contract to the next lowest bidder, the Nortwestern Manufacturing and Car Company, for the sum of $23,380. The car company at once furnished the required bond, which was accepted. The building is to be 69x150 feet, and three stories in height.

Water, Gas and Steam.

ORANGE, Mass., is petitioning the Legislature for permission to build water works.

THE bill is passed by the Virginia Legislature authorizing the city of Fredericksburg, Va., to borrow money to the extent of $60,000 to build water-works.

SPECIAL assessments for the laying of four miles of six-inch water mains and one and a quarter miles of eight-inch pipe in the village of Hyde Park, Ills., are now in process of collection. The work will call for about 600 tons of material.

LAKE VIEW, Ills., will lay eight miles of water-pipe and build five miles of sewers the coming season. The town authorities have made a contract with he city whereby the Police Magistrate may commit to the city bridewell all persons convicted before him.

WATER METERS.—An order has been introduced into the Mass., Legislature and referred to the Judiciary Committee, which proposes to have some legislative enactment to secure a public and impartial test by scientific persons of water meters before their introduction into general use.

THE Chicago, Burlington & Quincy Railway contracted with the municipal authorities of Sandwich. Ill., to deliver all the material for the new water-works of that city at an agreed price. When the bill was due the General Freight Agent of the road informed the authorities that the road would donate the whole amount—about $500—to the city. This is only another case of "soulless corporation."

MASS., WATER COMPANYS.——The Committee on Water Supply had under consideration the petition of George A. Parker and others for incorporation as the Lancaster Water Company, with a capital of $50,000, to which there is no objection.

The same committee also heard the petition of the town of Clinton that it may increase its water debt by the amount of $50,000 in order to extend its pipes; there was opposition to this scheme.

The same committee also heard the petition of Joel Burt and others of Sunderland for incorporation as the Sunderland Water Company with a capital of $10,000. No one made any objection.

Petition presented by Mr. Willcomb of Ipswich, that of S. W. Hopkinson and others, for an act of incorporation as the Bradford Water Company of Mass.

SPRINGFIELD, MO. FEB. 5.—The controversy over the local water-works built in this city the past season still continues. At the meeting of the city council last night the said system of water-works was formerly rejected by a vote of five to three, and the first bill of $20,000 presented to the city by Messrs. Perkins, Fellows and McElbany, who constitute the water-works company for the use of hydrants for the first three months, was also rejected by a similar vote. Dr. L. T. Wattson, Hon. L. H. Murray, Dr. E. A. Roberts, D. M. Noe and Dr. W. H. Park, the members voting against the formal acceptance of the water-works, contend that the company has not complied with the contract made with the city, and especially that portion of the same which gives to the city the right to purchase and operate the water-works at the expiration of ten years, which right can not yet be established, as the company has only built one system of water-works, locating the reservoir within the corporate limits of north Springfield, and entering into precisely the same contract with that corporation, in regard to its right to purchase, that has been made with this corporation.

Councilman Park also objects to accepting the work on the grounds of impurities in the water furnished, and it has been talked in the street that the company is considering the matter of instituting a suit for damages against Dr. Park on account of his statements. At present the company has not yet intimated that it would attempt to force the collection of its claims against the city through the courts, and what the end will be is yet to be determined. The councilmen opposing the water-works company, however, contend that they are in the right, and declare they will stand by the city's rights to the last, and challenge the company to test the matter by an appeal to the courts.—*Kansas City Times.*

Railroads.

THE Western Nail Association has reduced the card rate for nails from $3.40 to $2.60 per keg.

THE Vandalia R. R. is carrying gravel at cost to enable the farmers to make better roads.

THE Meigs Elevated Railway bill has been passed by the Massachusetts House by a vote of 124 to 65.

THE St. Johnsbury and Lake Champlain Railroad has just bought five new locomotives, and will lay about 50 miles of steel rails the coming season.

A DOUBLE track is to be laid on the Pittsburg, Cincinnati & St. Louis, between Columbus and Coshocton. The work will be begun early in the Spring.

IT is proposed to extend the Great Eastern Railway from Sorel to Point Levis, Quebec, a distance of 127 miles, to connect with the Intercolonial Railroad. The Government will be asked for a subsidy of $12,000 per mile.

GRADING between Plymouth and South Bend, on the Logansport extension of the Vandalia, is being pushed with vigor, and prospects now are that the trains of the Vandalia will be running into South Bend thirty days earlier than has been anticipated.

OFFICERS of the South Pennsylvania Railroad, known as the Vanderbilt road, deny the Pittsburg story that the project has been abandoned. They say the line is building as fast as possible and will be completed next year.

THE residents of Savin Rock and West Haven, Conn., are encouraged to believe that the long-talked-of branch of the New York, New Haven & Hartford Railroad to those points is likely to prove a fact. Stakes are being set on the route known as the centre route in the distinction of the so-called Shore and West routes.

THE Baltimore and Ohio Railroad Company, which some days ago purchased the lines of the National Telegraph Company along the West Shore and Nickel Plate Railroads, has now bought the entire capital stock of the Manhattan District Telegraph at a price something less than $100,000.

A CONVENTION of the car-accountants of the United States and Canada will be held in Rich- Va., on the 19th of May. The following local Committee of Arrangements has been appointed: Messrs. T. L. Courtney, J. R. McMurdo, N. H. Hotchkiss, and C. W. Harwood.

ARTICLES of incorporation were filed at Madison, Wis., by the Superior Short-Line Railway Company, organized to construct a spur road wholly in Douglas county from the St. Paul & Omaha line to St. Louis bay. The capital stock is $250,000 and the incorporators are officers of the St. Paul & Omaha Company.

CITY OF MEXICO, Feb. 10.—The Mexico and Vera Cruz Railway Company is curtailing expenses, eighty officials and several hundred workmen having been discharged, and one of the two freight trains stopped. This action has been taken in consequence of decreasing receipts, owing to the Central and National Railroads bringing no more freight over that line, and to the competition of the Narrow Gauge road in pulque traffic.

SPRINGFIELD, ILL., Feb. 6.—The St. Louis, Belleville & Eastern Railroad filed articles of incorporation to-day with the Sec'y of State to construct a road from Belleville, Ill., to East St. Louis, to connect with the bridge at that place, or any bridge to be built; capital, $608,000. The incorporators and first Board of Directors are: D. P. Alexander, of Wichiti, Kas.; H. A. Alexander, of Kansas City, Mo.; Louis F. Campbell, of St. Louis; Charles A. Mitchell, of Chicago; Russell Henkley, M. W. Weir, and Henry Davis, of Belleville.

GRADING on Pike's Peak Railroad is half completed betweeen Manitou an Crystal park and will be completed to the latter point on the 1st of May, about which time track laying will commence. Next year's tourists to Colorado will have an opportunity of visiting Pike's peak by rail.

TORONTO, ONT., Feb. 10.—The suit of Page, Newell & Co., of Boston, against John Proctor, of Hamilton, railway contractor, which has been pending for many months in the Court of Common Pleas division of the High Court of Justice, was concluded yesterday. The plaintiffs sought to compel the defendant to carry out a contract to purchase $40,000 worth of steel rails. The plaintiffs contend that they were ordered and that they were prepared to deliver them, but the defendant, having failed to secure the contract as he expected, afterward refused to accept delivery. The court decided in favor of the defendant.

THE Vandalia's construction corps has just completed the cutting down of the heavy grade at Stubblefield, west of Greenville, and reduced the grade from fifty-two to twenty-six feet per mile. A very heavy fill is also being made across Shoal Creek bottom, eight miles west of Greenville, where the road has recently been somewhat annoyed by high water. Another big fill is being made across Cloverland Bottom, east of Terre Haute, for a distance of over a mile. Here the track is raised from some fifteen to twenty feet for this distance, the grades at both ends being cut down to make a level stretch of track. It is all done without laying an extra track.

BATH, Me., Feb. 12.—A stock company, known as the New England Ship-building, Company, has been formed here, comprising the firms of Goss, Sawyer & Packard and Goss & Sawyer and a number of individual capitalists, with capital of $500,000. The two firms contribute $400,000, and Capt. Goss will manage the business. The company will own the ship yards, mills, etc., of the above firms, together with a marine railway and other properties. They have contracts amounting to $300,000. Sylvester Marsh, of Concord, N. H., is President; Guy C. Goss, Vice-President, and B. F. Packard, G. W. Hyde, Arthur Sewall, of Bath; B. F. Caldwell, of Concord, Directors.

THE Black Hills *Times* says it is an open secret that the Sioux City & Pacific intend to build to Fort Fetterman by next September. The Central Pacific has surveyed two lines during the past season throughout Wyoming from Ogden along the Sweetwater Valley to near old Fort Caspar. No explanation could be had from the engineers, but it is surmised that they were seeking connection with some Eastern Road, probably the Sioux City & Pacific. During the past season the Sioux City & Pacific has surveyed a line up the Cheyenne river to the head of Shawnee creek, where the road will strike the first valuable coal beds west of the Missouri river. Thence the road is along the Platte River to Fort Fetterman and westward. Cattle were shipped from this section last fall.

RAILROAD Curves.—A. B. Youngson, locomotive engineer, says: I wonder why it is that our railway companies are giving up the old fashioned method of buildin curves. Formerly the outer rail on a curve was laid on a grade two or three inches higher than the inner rail. This was done for the purpose of overcoming the centrifugal force which the train would have in turning the curve. Within a few years I have noticed that both rails are laid upon the same level, thus increasing the danger of the trains leaving the track. When an express train flies over the track at the rate of 35 miles an hour its centrifugal force in turning a curve is enormous.—*Boston Journal.*

[It is more likely that Mr. Youngson's head is not so "level" as it was several years ago].

AT the office in the Mills Building occupied by Gen. Winslow, the officers of the West Shore Rail oad, and the Receiver of the North River Construction Company, the following official statement was furnished for publication: "Upon the appointment of the Receiver of the North River Construction Company all the powers of the Board of Directors and officers passed to the Receiver. The company having completed the work for which it was organized, it remains only for it to settle its accounts and liquidate its indebtedness. The Directors are enjoined from exercising the duties usually devolving upon the board. Gen. Winslow therefore resigned his position, leaving Col. Walter Katté Vice-President."

Col. Katté is the Chief Engineer of the West Shore Railroad, and Gen. Winslow's election as President of the road has for some time been regarded as a foregone conclusion.

OF the countless good stories attributed to Artemus Ward the best one of is the one which tells of the advice he gave to a Southern railroad conductor soon after the war. The road was in a wretched condition, and the trains consequently were run at a phenomnally low rate of speed. When the conductor was punching his ticket Artemus remarked. "Does this railroad company allow passengers to give it a tvice, if they do so in a respectful manner?" The conductor replied in gruff tones that he guessed o. "Well," Artemus went on, "it occurred to me it would be well to detach the cow-catcher from the front of the engine and hitch it to the rear of the train. For you see we are not l able to overtake a cow, but what is to prevent a cow strolling into this car and biting a passenger?"

GREENVILLE, S. C., Feb. 11.—The officials of the Charlestown, Cumberland Gap and Chicago Air Line Railroad announce that the Louisville and Nashville Railroad Company is going to furnish the funds for the completion of the road, and that prominent officers of the Louisville and Nashville Company have sent for the plans and estimates of the new line, in or er to determine how much money is needed to finish the road. The advantages that would accrue to the Louisville and Nashville Company if it could control this new seaboard line would be enormous. It is estimated that $6,000,000 will finish and equip the projected line, which is to run from Aiken S. C., to London, Ky. A good portion of the road is already graded, and several cities along the line are subscribing liberally, in order to secure i s rapid completion.

IT is said that the matter of building a road from Chippewa Falls to St. Paul, which for some time has been under consideration by the Wisconsin Central people, has been definitely settled and the road is to be a reality. Although surveys have been in progress nearly a year now, and various routes between the two points have been discussed, and although a locating engineer more recently has been put to work, it was not until Tuesday that the final decision to build the line was reached. The eastern gentlemen interested in the scheme are determined that, when they once begin the work of construction, there shall not be a day's time lost until the road is completed and ready for operating. There are still several points undecided in connection with the exact route to be followed, but the surveyors are at work, and it is probable that a satisfactory line will be decided upon by the time the weather will permit construction work, and that when that time shall have come everything will be in readiness to take the first steps toward the northwestern metropolis. If construction work begins with the early spring, as is now indicated, the new road will be completed and open for traffic before the close of the present year. The extension will be about 100 miles in length, and will cross the Mississippi River at a point near Stillwater, Minn.

STAMFORD, Conn., Feb. 11.—The Boston and New York Air Line Railroad Company, commonly known as the Olmstead Parallel has purchased the right of way for its line from the Stamford town line west to the Mianus River, and is now negotiating for land west of the river to Greenwich. Work is being done on the cuts through Palmer's Hill at Greenwich and Sheep's Hill at Coscob, and at Southport 200 men are engaged in blasting rocks. At this point there is sufficient work to keep the men busy for two mont s. Ground will be broken at Saugatuck in a day or two, but work will not be begun in Norwalk until the question whether or not a tunnel shall be built at Spring Hill is decided. As soon as the weather will permit a test will be made by boring at different points to ascertain if the ground is of a quality to make a tunnel feasible. If it is not, the route across Union Park will be followed.

At Orange, Stratford, and Milford six gangs of men are at work, and the right of way has been mostly ecured for those sections. Much trouble is being found by the company in securing land at what it is considered a fair price, as the owners are aware that the road must require certain available locations for the purpose of advantageously expending a certain amount of money in construction before March 22. In some cases demands, which the officers of the road consider exorbitant, have been acceeded to, but in many instances condemnation proceedings will be resorted to. It is said the company has the offer of three inlets into New York from the State line at Greenwich, all of them practicable and advantageous. Under the State law of New York the officers of the company expect to find no trouble in building the road from Greenwich to Harlem River. They regard Connecticut as the fighting ground, and propose to construct their lines in this State before starting in New York.

IRON, METAL AND COAL MARKETS.

PHILADELPHIA, Feb. 14, 1884.

The latest developments in Iron and Steel indicate the probability of a further improvement in demand, but no upward tendency in prices as has been predicted by some authorities. The Iron market is too well supplied, and the iron making capacity is too far above the requirements to allow of any improvement in selling prices. The best sales of Foundry Iron reported this week, have been at $21, but more Iron is selling at $20. No. 2 has sold at $19, and a good deal of this number went at $18.50. Gray Forge averages $18, though the special makes command $18.50, and some inferior makes are offered and sold at $17.50 delivered. Southern Irons are in active request, but the supply is deficient. Bessemer Iron is nominally $20, but will not sell above $19.50 excepting for very small lots. 20 per cent. Spiegeleisen would sell at $28@$28.50, but is held at $29. A fair amount of business has been done this week in Anthracite and Charcoal Blooms, at old prices, for March and April delivery. Several thousand tons of Muck Bar have sold, and this increased demand has improved prices to $32@$32.50. Merchant Iron is moving in larger lots; some of the country mills have secured a fair amount of business, which will keep them from competing with the others for a few weeks. Refined Iron sells at 2c.@2.10 in small lots, with large lots at 1.90. A better feeling prevails in the iron trade, because of the presentation of so many requirements. Plate and Structural Iron are in better request, and there is a large amount of business in sight for engineering requirements. The Steel Rail mills are not taking any heavy orders, and are holding prices nominally at $34@$35, at which large orders will be placed before April. Crop ends $19.50.

PITTSBURGH, Feb. 14, 1884.

The floods through the West have interfered with the making and shipping of iron, and the receipt of orders during the past week, and it is not likely that there will be any improvement for two or three weeks to come. A great deal of damage has been done and it cannot be repaired under several weeks. Meanwhile, trade will suffer; but the requirements exist, and will be presented a little later on. Iron men generally, are hopeful of a good demand for nearly all kinds of Crude and Finished Iron. Hardware dealers throughout the West have been sending in good reports up to a week ago, with a good many orders for Heavy Hardware, Carriage Steel, and Steel for manufacturing purposes generally. Machine shops in the West are short of material, and are beginning to buy more freely, but the flood has arrested demand from that direction. The mills here have suffered considerably, and at present writing the water is still rising. The Steel Rail mills are full of orders. Carnegie's mill has a large amount of work on hand. The bridge works are also well sold up. The window glass workers resume on the 15th inst. The sheet mills are all busy. A good many mines are flooded out, and a general strike is threatened along the Upper Monongahela.

CHICAGO, Feb. 13, 1884.

A healthier tone has been imparted to all branches of trade up to within a short period, but the general flood along the Ohio has interfered with shipments in that direction. The January business was large and but for the flood, the February business would have exceeded it considerably. Bar Iron is moving freely at 1.80@2.05 according to quality. Structural Iron is in fair request and plate is moving at 2.50@2.60; Galvanized is in active demand; no change in price reported. Foreign Irons are very dull. A large amount of Pig Iron has been delivered on old contracts but very few new ones have been placed within a week or two. Inquiries are in in hand for April and May deliveries, but buyers are somewhat backward about placing orders. Ingot Copper is quoted at 14 for Arizona; Lake Superior, 14¾ with a light shading on large orders. Pig Lead, 3¼, and weak. Steel Rails are without activity at present.

COAL.

PHILADELPHIA, Feb. 14, 1884.

Another slight improvement has taken place in the sizes most in request, and a general improvement is looked for, from this time out, owing to the evidences coming to the surface, of the diminution of stocks east, west, and in the line trade. The latter demand has grown stronger and nearly all consumers are running short of stocks, and in some cases, deliveries are barely sufficient to keep consumers supplied. The coal trade has fallen off, on account of the warm weather, but still the yards are doing a fair business. Western markets are low in stocks, and inquiries have been received within a day or two, which will lead to large orders next week, or the week after. The Bituminous Coal trade is unusually dull, and will remain so until the spring freight rates are fixed, and the time comes for the placing of the heavy orders. Efforts are being made by the leading companies to come to some understanding as to production, and to arrange for the extension of markets; while there are some probabilities for finding a wider market for Bituminous Coal, the prospects for any kind of combination of interests are not bright. A great deal of money has been invested in coal lands, and a good many openings have been made. Feeders have been built, and this will induce lessees and investors in coal lands to produce as much as possible, as long as there is a fraction of profit to be made.